


What's buggin' you?



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Entomology?

- Study of insects
- Other related animals (known as arthropods), such as mites, spiders and scorpions.




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Why should we study insects?

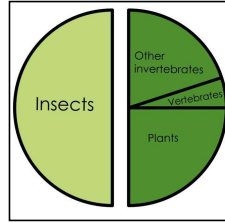
- Most diverse group of organisms
- Approx. 80 percent of the world's species
- 30 million species and still counting



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Insects rule the world!

- There are more insects than all other plants and animals combined
- 1 out of every 5 animals is a beetle!



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Imagine a world without



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Why should we study insects?

- Affect many aspects of human life, from food production to housing.
- Help by pollinating crops, eating other insects, and recycling nutrients in nature.
- Help to advance knowledge in many scientific fields, such as ecology, molecular biology, medical research, forensics, even robotics!

Some cause harm by spreading disease, destroying plants, or damaging homes.



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Why should we study insects?

- Studying entomology teaches us which insects are harmful and which are helpful, and how we can deal with them to make our lives better.



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When you see an insect, do you experience:



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Why should we study insects?

- Misconceptions about insects
- Majority of insects are harmless or beneficial
- Only 3 % are pests!



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Growing plants

- Plant-feeders
- Storage pests

- Bees and other pollinators
- Beneficials – natural enemies

AGRICULTURAL ENTOMOLOGY



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Protecting animals

- Fleas, flies, ticks, lice affect domestic animals and livestock

VETERINARY ENTOMOLOGY



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Protecting people

- Insects spread diseases
- MALARIA

MEDICAL ENTOMOLOGY



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Fighting crime

- Insects provide clues to time/location of death

FORENSIC ENTOMOLOGY



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Rubes By Leigh Rubin
RubesCartoons.com

Never try to pull one over on your
forensic science teacher.

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Protecting environments

- Invasive insects cause severe damage to forests and native plants

FOREST ENTOMOLOGY



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Protecting homes

- Household pests cause annoyance
- Contaminate food and surfaces

URBAN & STRUCTURAL ENTOMOLOGY



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Discovering species

- 30 million and still counting
- Only ~ 1 million have been described

TAXONOMIC ENTOMOLOGY



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Insects and their relatives

- Arthropods are numerous and diverse
 - Insects (beetles, flies, moths, earwigs, aphids)
 - Arachnids (spiders, ticks, mites, scorpions)
 - Crustaceans (crayfish, crabs, lobsters, sowbugs)
 - Centipedes, millipedes
- Exoskeleton is a hard outer shell
- Jointed appendages, segmented body
- *Not arthropods*: slugs, snails, earthworms

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What makes an insect an insect?

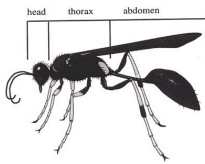


Can you count the ant's legs?

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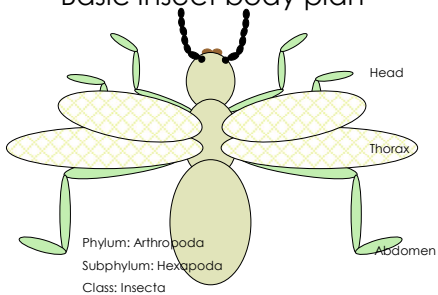
All insects have:

- Six legs
- Segmented bodies
- An exoskeleton



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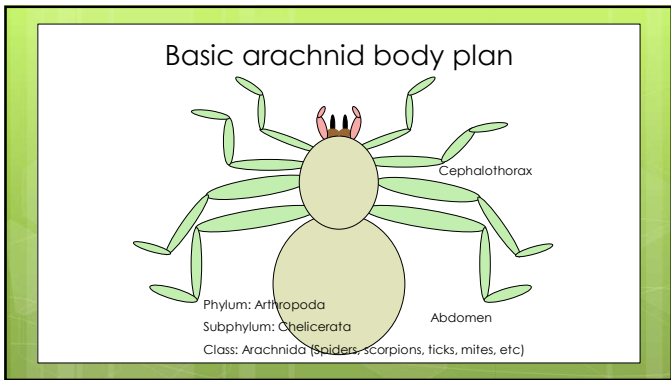
Basic insect body plan



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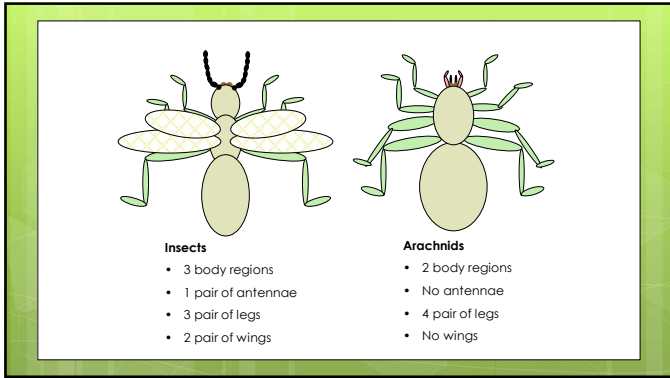
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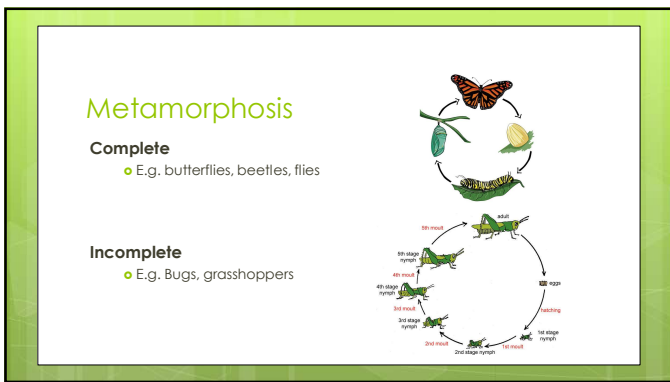
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Why are insects so successful?



- Small size
- Multigenerational
- Flight
- Metamorphosis
- Wide variety in food choices
- Wide variety in habitat resources

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Size wise

• Largest

Giant Weta - cricket-like creature with a wingspan ~ 7 inches.



• Longest

Chan's Mega Stick ~ 14 inches.



• Heaviest

Hercules Beetle ~ 0.25 lbs.

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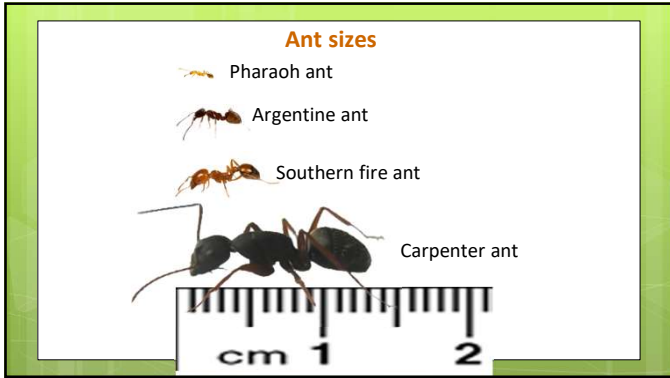
Size wise

• Smallest

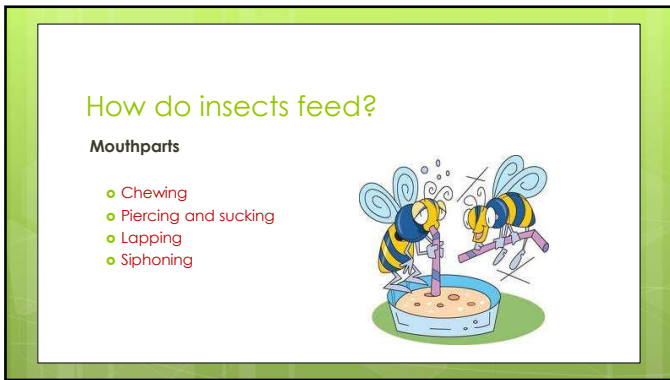
Fairy wasps - tiny wasps ~ 0.139 mm (0.0055 in).



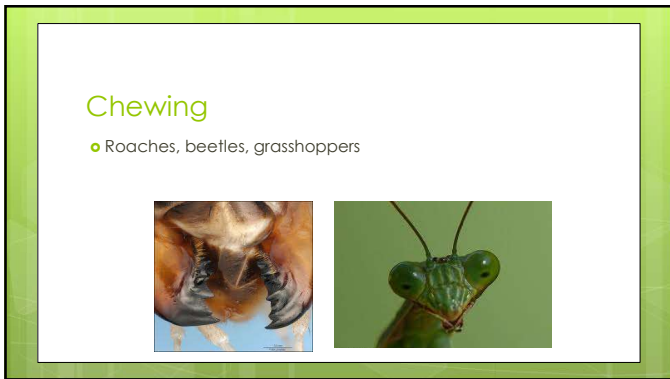
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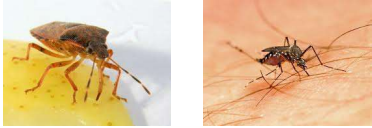
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Piercing and sucking

- Bugs (Hemiptera)
- Diptera (Mosquitoes)



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Lapping

- Honey bees



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Siphoning

- Butterflies and moths



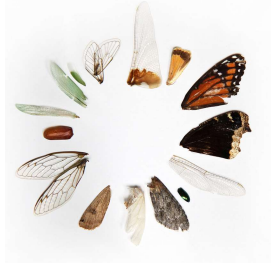
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Diagnostic tools

- An insect's mouth parts and its method of feeding determines the type of injury it causes.
- Biting/ chewing mouth parts → physical removal of plant tissue.
- Piercing-sucking mouth parts → leave plant intact but remove fluids.
- These differences have important implications for diagnosis and management.

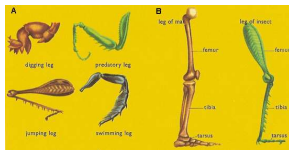
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Other ways to ID insects: wings



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Other ways to ID insects: legs



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Other ways to ID insects: antennae



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What do insects eat?



Lots of different foods!

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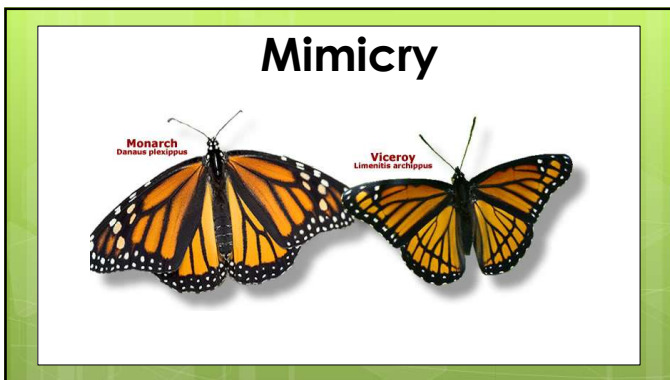
Where do insects live?



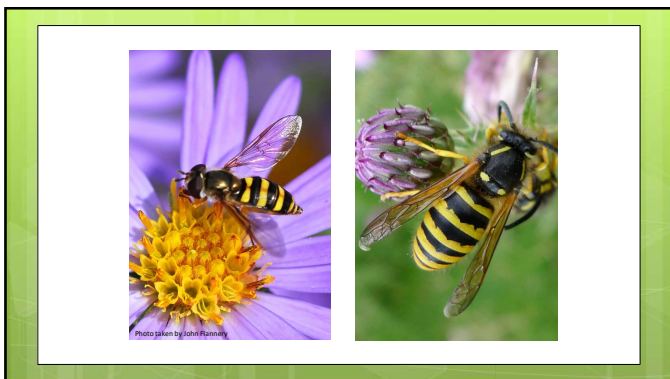
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Types of insects

Common insect orders

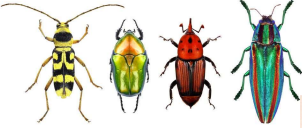

- Coleoptera (Beetles)
- Lepidoptera (Butterflies and moths)
- Diptera (Flies, mosquitoes)
- Hemiptera (True bugs)
- Hymenoptera (Wasps, ants, bees)
- Blattodea (Roaches, termites)

Not all insects are bugs!!!



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Coleoptera: The beetles





(koleos=sheath, ptera=wing)

- Two pairs of wings
- Wings can be folded over abdomen
- "Elytra" forewings heavily sclerotized - protective covering
- Membranous hindwings folded underneath forewing
- Chewing mouthparts
- Adults and larvae feed on plant or organic material

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Lepidoptera: Butterflies and Moths



(Lepido=scale, ptera=wing)

- Two pairs of membranous wings with scales
- Unable to completely fold wings over abdomen
- Larvae (caterpillars) - chewing mouthparts
- Adults - piercing/siphoning mouthparts
- Larvae feed on plant material
- Adults feed on nectar or not at all

Butterflies - wings held vertically at rest, diurnal
Moths - wings held horizontally at rest, nocturnal

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Lepidoptera: Butterflies and Moths

Butterflies - wings held vertically at rest, diurnal
Moths - wings held horizontally at rest, nocturnal



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Diptera: The Flies



- (di=two, ptera=wing)
- Only one pair of membranous wing visible
 - Second pair of wings functions as a balance organ - the haltere
 - Wings cannot completely fold over abdomen
 - Piercing/sucking and chewing mouthparts
 - Larvae (maggots) feed on plant and animal tissue
 - Adults feed on dead/decaying material

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Hymenoptera: Wasps, Ants, Bees



- (hymeno=god of marriage, ptera=wing)
- Social insects
 - Two pairs of membranous wings
 - Wings cannot completely fold over abdomen
 - Some groups apterous (wingless)
 - Stinging organ - ovipositor can be used in defensive capacity
 - Piercing/sucking or chewing mouthparts
 - Adults feed on plant material, nectar, or other insects



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Hemiptera: The True Bugs

(hemi=half, ptera=wing)




- Two pairs of wings
- Wings can be folded over abdomen
- Half of the forewing is sclerotized – “hemelytra”
- Hindwing folded under forewing
- Piercing/sucking mouthparts
- Adults and immatures can feed on plant material or other insects


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Hemiptera: Three sub orders

Auchenorrhynca








Sternorrhynca







Heteroptera

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Orthoptera: Crickets, grasshoppers, locusts, katydids

(Ortho=straight, ptera=wing)

- Two pairs of wings, can be folded over abdomen
- Forewing straight (does not curve over abdomen), leathery and narrow (usually)
- Hindwing folded fan-like beneath forewing - large surface area
- Legs modified for jumping or fast running
- Chewing mouthparts
- Adults and immatures can be plant feeders

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Blattodea: Termites, roaches



- Adults and immatures feed on dead/decaying plant material
- Chewing mouthparts
- Decomposers

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Termites



- (Formerly, Isoptera, iso=equal, ptera=wing)
- Adult sexual forms have two equal pair of wings
 - Most are apterous
 - Social insects
 - Chewing mouthparts
 - Adults and immatures feed on dead/decaying plant material

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Dermaptera: Earwigs



- (derma=skin, ptera=wing)
- Two pairs of wings: short and leathery forewings with very thin hindwings
 - Both sexes have prominent "cerci" at the end of the abdomen
 - Chewing mouthparts
 - Adults and immatures feed on any kind of organic material

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Thysanoptera: Thrips



- (thysano=fringe, ptera=wing)
- Winged species have two pairs of thin strap-like wings fringed with fine hairs
 - Elongated tubular body, ~ 1 mm in length
 - Asymmetrical, rasping mouthparts
 - Adults and immatures feed on plant material
 - Singular and plural is 'thrips'

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Insect names



Entomologists say:	Bug	Beetle
Most people say:	Bug	Bug
Scientific name:	Hemiptera	Coleoptera

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Insect names



Beetle

True Bug

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Contact



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