

Insects, Our Allies

Lesson Path: ["Bug Appetit" - Path on The Wonderment](#)

Look around you, there is probably an insect within 10-15 feet of you.

There are over 1 quintillion insects flying crawling, and creeping around our planet. That's a 1 with 19 zeros!!

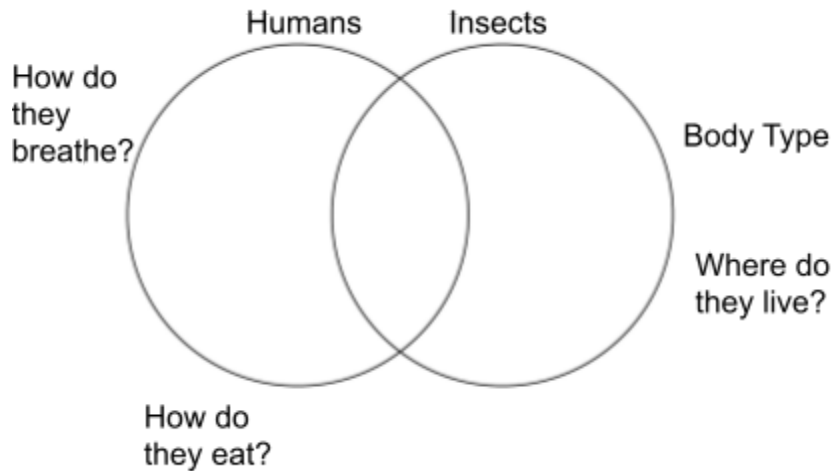
Write that number out here: _____

And there are one million insect species (thats a 1 with 6 zeros)

Write that number here: _____

The insects outweigh and outnumber humans and animals, accounting for 75 % of all animals.

Let's do a size up of our bug friends. How do we compare?



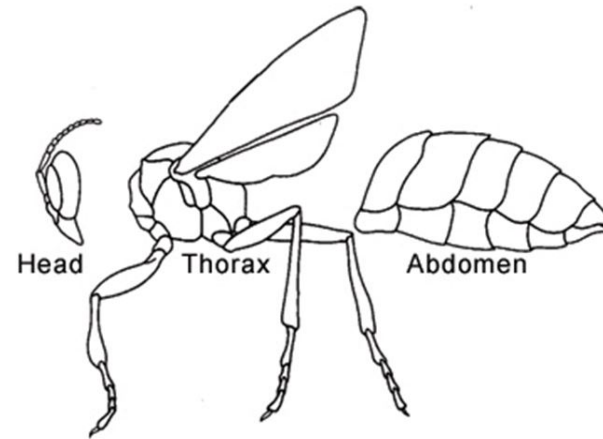
Insects don't have a skeleton on the inside, instead it's on the outside, called an exoskeleton, and it is made out of the same material as fingernails!

They are so successful because of their unique **adaptations**.

Your challenge: Create your own adaptation!

How to: Using a notecard and a paperclip, make a mouthpart that can fit onto this hexbug. When we put two hexbugs together, the objective is to get one to be cornered. Can you think of an adaptation to help you win in a round of ...

HEX BUG SUMO! HEX BUG SUMO! HEX BUG SUMO!



Each insect wears different clothes, they all have the same body design.
front (head)
middle (thorax)
back(abdomen)
They also have 6 legs!

My Design using a notecard and a paperclip:



Bugs with Class

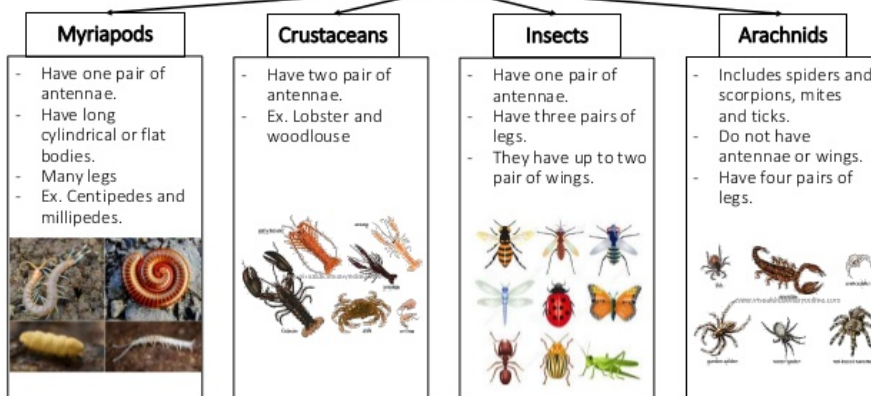
Bugs is a general term and is not really scientific. Scientists use the word 'insect,' as a class of arthropods. It describes an animal that has 6 legs, 3 body parts. So where does a spider belong? A spider is an arachnid, like scorpions and ticks. A myriapod (a thousand feet) are the millipedes and centipedes. Crustaceans, like lobsters, crabs, and shrimp, are also arthropods and have 5 pairs of legs.

You try! Insect or not?

Organism	Yes	No
Millipede		
Tarantula		
bees		
cockroach		
spiderman		

Invertebrates

1) Arthropods



How do bugs live?

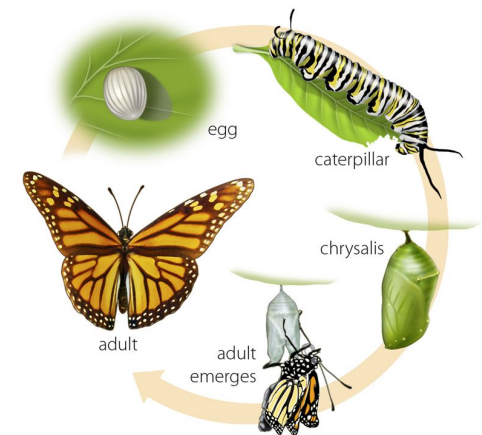
Try this! Take a piece of fruit, put it by a jar and leave it by a window.

Watch as a bug develops from an egg to a fly! **Get parental permission before breeding fruit flies- say it's for science!

My observations:

Metamorphosis is the total body transformation from an egg to an adult form. This adaptation is successful for a lot of bugs- 65% of all insects metamorphosize. What is the benefit of having two different life stages? The young and the old forms don't compete for resources!

Egg
Larvae
Pupae
Adult





Insect sights and sounds

Honeybees can see ultraviolet light. And many insects, like flies have compound eyes- many lenses in each eye. This means there's many paths for a light to take, and allows an insect to take in its surroundings, and detect moving objects.

Each of the lenses (called facets) is attached to the brain by a nerve.

Dragonflies have 20,000 facets!

What do you think life would look like from a bug's perspective?

Try it! Gather some straws and put them in a toilet paper tube. What does it look like?



Insect orchestra:

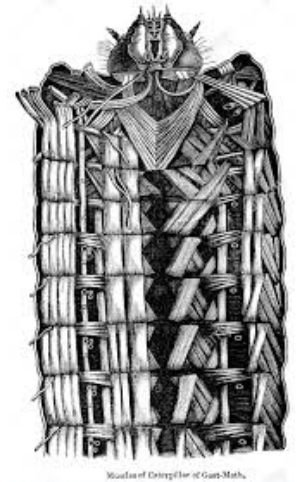
Chirp, Trill, lisp, zit, tsip- can you name the bug that makes these sounds?

In the summer, bugs provide the backdrop music!

Type of Insect	How it makes sound	Instrument
Grasshopper		Violin
Cockroach	blows air through spiracles	
Cricket	Scratchy wing part against a scrapy wing part	Wooden weerow
cicada	Blowing wind through abdomen	drums

Let's move!

Bugs are strong, and they don't even have a gym membership. Some insects can lift 50x their body weight with just their mouthparts. While humans have 700 muscles, grasshoppers have us beat at 900 and caterpillars have over 4,000 (picture to the right). Ants have incredible strength. Usually, the bigger something is, the stronger it is. But that also means it weighs more. Bugs have figured out this balance to optimize their strength, by having a large cross-section compared to their body.



Let's Eat! All that gymnastics made me hungry.



Let's eat an insect! Much of the world already uses this incredible resource for a high quality protein. And we might need to jump on board. By 2050, the population is estimated to reach 9 billion. That's a lot of mouths to feed! Eating bugs is sustainable

and cheap and tasty too! You can order your own take-out (call Grubco 1-800-222-3563) meal of mealworms, wax worms, or crickets, or find your own! (Avoid collecting bright colored bugs as that coloration is probably to warn predators not to eat them!) Roast them or bake them into chocolate chip cookies!

Take a breath- Bugs don't have lungs, instead they have tubes that bring air from the outside to the inside. This keeps bugs small- If they get too big, then they won't be able to get enough air down the tubes!

Clean-up time

Cockroaches, ants and termites are the garbage cleaners of the world! If it wasn't for termites, we'd be 100 stories deep in trees.

Let's go out and catch a bug!

How do you catch bugs?

- Aerial Net- Sweep through the air with a net
- Pitfall trap- dig a hole and put a container in the trap so it's at level to the ground.
- Beat netting- wack a shrub and see what lands in the trap
- Berlese Chamber, for soil bugs (see soil lesson)



You try! What did you find?

- Black millipedes, Centipedes
- Spider
- Butterflies
- Bees- bumblebees, honey bees
- Earwigs
- Sow bugs/roly pollies-



- Not insects, crustaceans
 - Live in family groups
 - Give birth to live young
 - The young help clean up the home
 - Feed them pinecones, carrots, dried leaves
 - Watch them molt- they will leave a fingernail sized coating behind
- Tarantulas- are not dangerous, females live 25 years and never leave the burrow, males roam around and die at the end of the winter

- Velvet Ants- Wingless wasps, males have wings, females don't
- Females sting; No predators, nothing wants to eat them!



To keep or not to keep

How do you preserve an insect?

- Just pin them, they dry out.
- Need right temperature and consistent humidity
- Keep away from mice!
- Soft and small insects are kept in alcohol

What insects can you find in your backyard?

- Jerusalem cricket
- Beetles in Coral Pink Sand Dunes-
 - Tiger Beetle- 1in long, fast and fierce
 - Only beetle that can catch another beetle in the air!

Ask an entomologist!

An entomologist is someone who studies insects:

What are insects again?



"If you like insects, and want to make it into a career, you can!"

Notes from interview with Christy

Bills from the Natural History Museum:

How do you manage a collection?

- 300,000 insects (a small collection compared to the Smithsonian)
- Mostly from Utah
- Some specimens date back to the 1800's

There are many types of entomologists.

Entomology physiologist- someone who studies the inside of bugs

Agricultural entomologist- someone who studies bugs that interact with crops

Taxonomist- someone who specializes in studying how bugs relate to each other, can be very specific, narrowing down to tiny details like the shape of heads

Best part of being an entomologist?

- Bugs are important, and fascinating!
- Accessible for everyone!

What is the hardest part

- It is humbling because you will never know everything!

Learn more!

Check out this playlist of insect related information!

Ted Insect Playlist

https://www.ted.com/playlists/5/insects_are_awesome

Watch one and write what you learn here (or in your Science notebook!)

Additional Resources:

<https://www.si.edu/spotlight/buginfo/bugnos>

Bill Nye the Science Guy: T7-1 Insects

Insect Facts

<https://www.amentsoc.org/insects/fact-files/>

<https://www.natgeokids.com/za/discover/animals/insects/butterfly-life-cycle/>

How did metamorphosis evolve?

<https://www.scientificamerican.com/article/insect-metamorphosis-evolution/>

Insects Kinematics

<https://www.nature.com/articles/37253>

Bug vision and bug vision activity

<https://www.nsta.org/publications/news/story.aspx?id=50212>

Why aren't we eating more insects

<https://www.nytimes.com/2018/09/07/t-magazine/eating-bugs-food-restaurant.html>

Térmites

<https://www.google.com/amp/s/www.pbs.org/newshour/amp/science/termite-transform-home-poop-palace>

5 vital roles insects play in our ecosystems

<https://www.nationalgeographic.com/magazine/2020/05/insects-play-these-five-vital-roles-in-our-ecosystem-feature/>

Beginner's Insects Songs

<http://songsofinsects.com/identification-basics>

Velvet Ants

<https://www.newscientist.com/article/2172959-female-velvet-ants-are-so-scary-no-other-animal-dares-eat-them/>