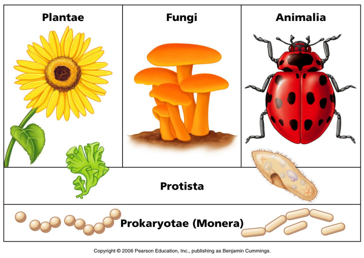
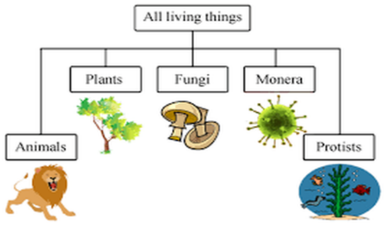
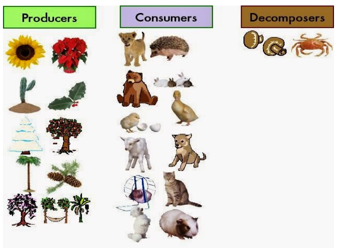
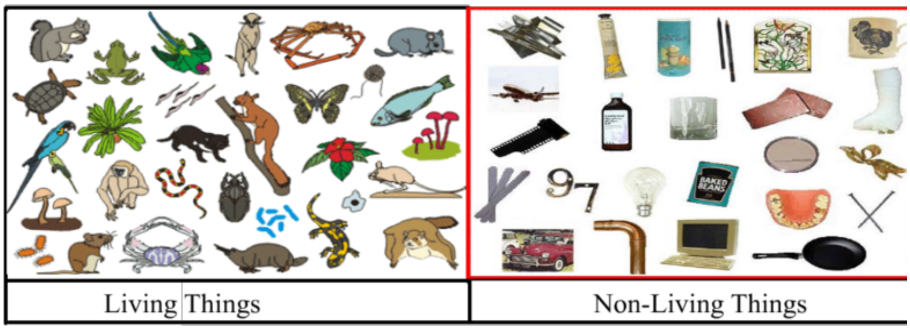


Unit 3:

Variety of Life







Curriculum Outcomes

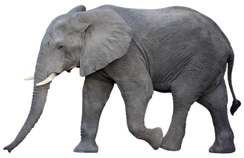
STSE	Skills	Knowledge
Students will be expected to	Students will be expected to	Students will be expected to
Nature of Science and Technology	**Initiating and Planning**	**300-15** describe the role of a common classification system for living things
104-5 describe how results of similar and repeated investigations may vary and suggest possible explanations for variations	**204-1** propose questions to investigate and practical problems to solve	**300-16** distinguish between vertebrates and invertebrates
104-8 demonstrate the importance of using the languages of science and technology to compare and communicate ideas, processes, and results	**204-6** identify various methods for finding answers to given questions and solutions to given problems, and select one that is appropriate	**300-17** compare the characteristics of mammals, birds, reptiles, amphibians, and fish
105-1 describe examples of scientific questions and technological problems that are currently being studied	**204-8** identify appropriate tools, instruments, and materials to complete their investigations	**300-18** compare the characteristics of common arthropods
105-5 identify examples of scientific knowledge that have developed as a result of the gradual accumulation of evidence	**Performing and Recording**	**300-19** examine and describe some living things that cannot be seen with the naked eye
Relationships Between Science and Technology	**205-7** record observations using a single work, notes in point form, sentences and simple diagrams and charts	**302-12** describe how microorganisms meet their basic needs, including obtaining food, water, and air, and moving around
106-3 describe examples of improvements to the tools and techniques of scientific investigation that have led to new discoveries	**205-8** identify and use a variety of sources and technologies to gather pertinent information	**301-15** compare the adaptations of closely related animals living in different parts of the world and discuss reasons for any differences
Social and Environmental Contexts of Science and Technology	**Analysing and Interpreting**	**301-16** identify changes in animals over time, using fossils
107-1 describe examples, in the home and at school, of tools, techniques, and materials that can be used to respond to their needs	**206-1** classify according to several attributes and create a chart or diagram that shows the method of classifying	
107-6 provide examples of how science and technology have been used to solve problems around the world	**206-9** identify new questions or problems that arise from what was learned	
107-11 identify examples of careers	**Communication and Teamwork**	
	207-2 communicate procedures and results, using lists, notes in point form, sentences, charts, graphs, drawing, and oral language	

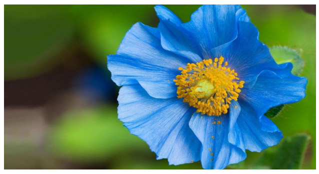
Think about the layout of a grocery store, what do you notice?

Why do we classify things?

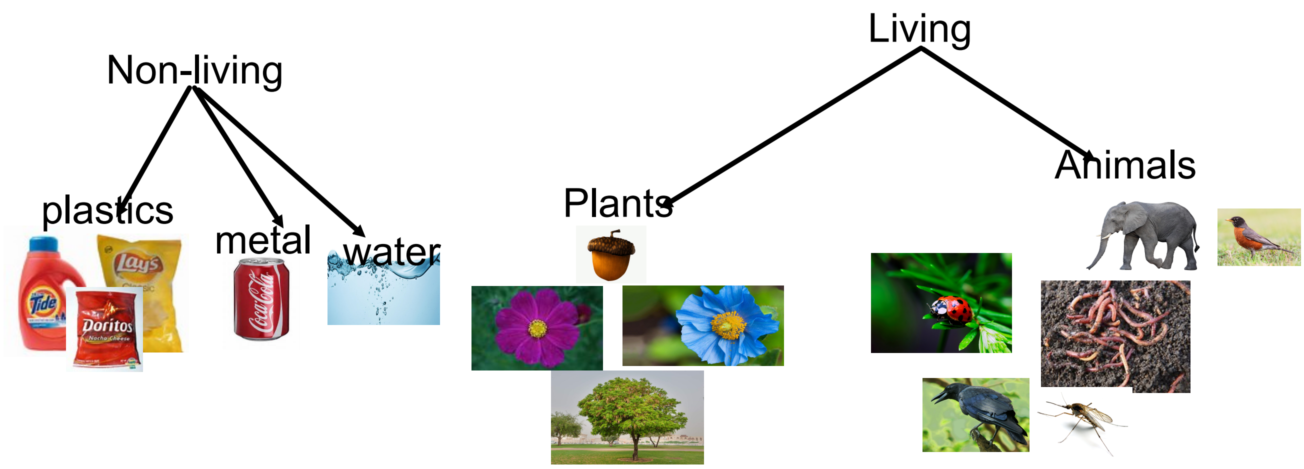
- Supermarket aisles
- Libraries
- Classes
- Teams/sports
- Members of a family
- Roads
- Cities
- Money

How would you group these items and why?





How would you group these items and why?



Taxonomy - is the science of grouping or organizing things into groups based on common characteristics.

Classifying Living or Non-living

Science biologist study life, they need to be able to tell the difference between living things and non-living things.They ask themselves a set of questions:

Can it grow and develop?

Can it reproduce to make more of its own kind?

Can it make or get food?

Can it use food?

Can it sense and react to living and non-living things in its surroundings, and react to them?

Is it made up of cells?

If the all are yes then classify as living.

Ecology is the study of how living things interact with each other

Factors of our Environment

Biotic are living factors include:

- Plants
- Animals

organisms

- Dead organisms & Waste Products
  (came from living at one time)

Abiotic are nonliving factors that affect other living things:

- Air
- Water
- Soil
- Rocks
- Light
- Temperature
- Climate

Don't copy

Scientists classify organisms and assign each one a universally accepted name.

- Scientists classify because it is an **organized way to communicate** about the same organism all over the world. A classification system was developed because:
- Scientists once communicated about organisms by using common names.
- Common names can vary among languages and geographical regions.

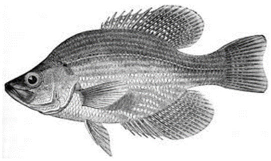
Ex: Mountain lion, puma, cougar, and panther are all **common names for the same organism.** It would be confusing for scientists to communicate across the world about an organism only using common names.

There are many *tree* frogs but **only one** with the scientific name ***Agalychnis callidryas***.

Scientist over time has developed a naming system that they all under stand using binomial nomenclature

Early classification systems

- Aristotle grouped everything into simple groups such as animal or plant
- Then later grouped animals according to how they moved, if they had live young or laid eggs, and so on...


The modern classification system :

Developed by Carolus Linnaeus

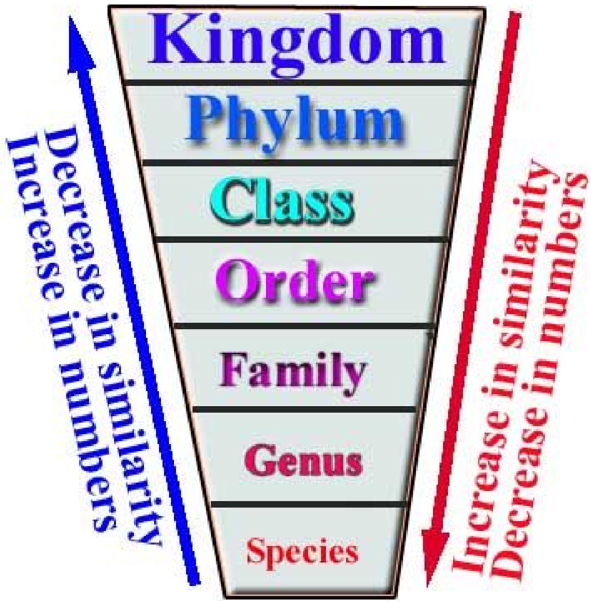
Consists of 7 levels:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

copy

Biologist group living things

Hierarchy of classifying living things



King

Philip

Came

Over

For

Green

Skittles

Don't copy

1) **Kingdom**-broadest and most inclusive level that includes a group of related phyla

2) **Phylum**-a group of related classes

3) **Class**-a group of related orders

4) **Order**-a group of related families

5) **Family**-a group of related genera

6)**Genus**-a group of related species

7)**Species**-smallest and least inclusive level that names one particular type of organism

Don't copy

Kingdoms

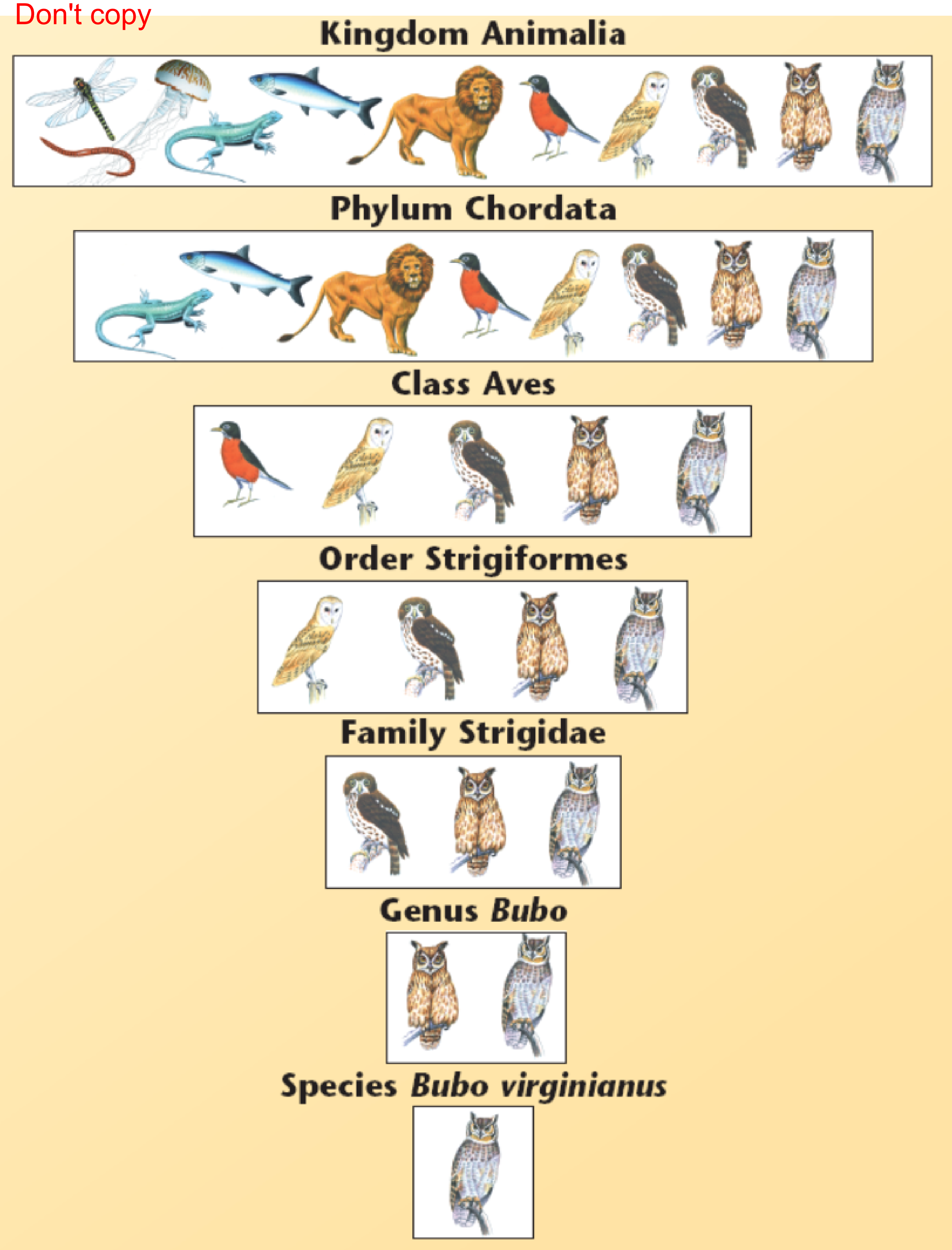
- Any grouping of organisms into kingdoms is based on several factors:
  - Presence of a nucleus
  - Unicellular or multi-cellular
  - How organisms get their food.

- Five different kingdoms of organisms are generally recognized by scientists today
  - **Protists**
  - **Monerans**
  - **Fungi**
  - **Plants**
  - **Animals**





Don't copy


Kingdom Animalia
Phylum Chordata
Class Aves
Order Strigiformes
Family Strigidae
Genus *Bubo*
Species *Bubo virginianus*

Don't copy

Classification Level				
Common Name	Human (?)	Canada goose	Lake darner	Mosquito
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Arthropoda	Arthropoda
Class	Mammalia	Aves	Insecta	Insecta
Order	Primate	Anseriformes	Odonata	Diptera
Family	Hominidae	Anatidae	Aeshnidae	Culicidae
Genus	*Homo*	*Branta*	*Aeshna*	*Aedes*
Species	*sapiens*	*canadensis*	*eremita*	*fitchii*

We share the earth with many other living things that are found in many different places such as in water, on land, in hot deserts, in deep oceans and in the polar regions. They can even be found living inside you. Some are large, like a Blue Whale (30 m long) but some are microscopic, like bacteria.

* We classify things into groups in order to make things easier to understand.

* All living things share a set of charateristics in order to survive.

* All living things are grouped into the first level of classification known as a "kingdom".

There are 5 Kingdoms

1) Animals

2) Plants

3) Fungi

4) Monera (Bacteria)

5) Protists (Single-cell)

The Diversity of Living Things Continued

2) Phylum

Animals have been divide into 25 phyla (groups) . They may be grouped by similar in basic structure.

Ex) The elephant, fish and polar bear all belong to the Chordata Phylum because they all have a backbone.

3) Class

Class members have more common characteristics.

Ex) Amphibians

- -All live part of life in water and on land
- - Cold Blooded
- -Back Bone
- -Moist, smooth skin

Ex)

Invertebrates	Vertebrates
Arthropods	Mammals
Spiders	Birds
Insects	Amphibians
	Reptiles
	Fish

4) Order

Groups are more alike than those of class

EX) Three primary orders of Amphibia within the Subclass Lissamphibia

- Caudata (Urodela) - Salamanders
- Anura (Salientia) - Frogs and toads
- Apoda (Gymnophiona) - Caecilians

5) Family

Groups are more alike than those of order

ex) Family Cryptobranchidae - hellbenders

- "hidden gill"
- contain the largest living salamanders
- distributed in eastern US, Japan, one species in China to 9
- *Cryptobranchis alleganiensis* found in Appalachians of Kentucky/Tenness

Family Ambystomatidae - mole salamanders

- restricted to US and Canada
- represented by marbled, tiger, and small-mouthed salamanders

6) Genus

These are made up of groups that are very similar, but the groups cannot breed together. Ex) Coyotes & Wolves

7) Species

Is a population of animals that can breed with one another. The young grow up to look like their parents.

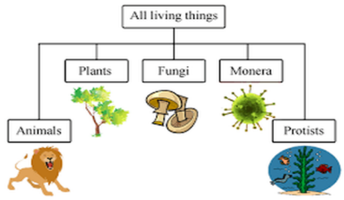
Proper terminology

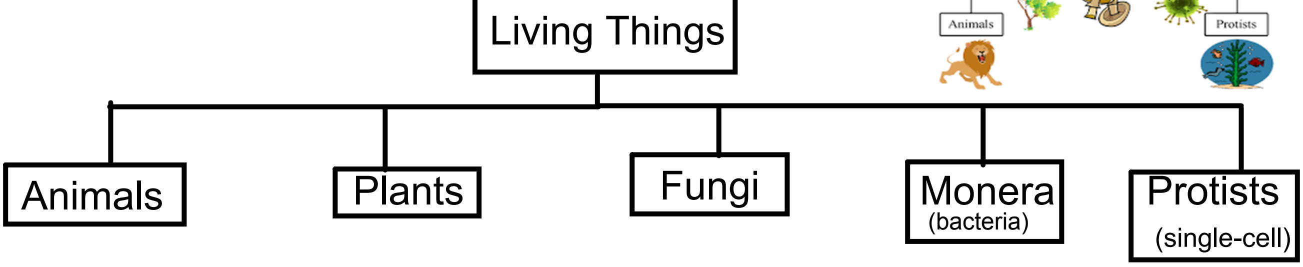
We will look at this in a bit

What are some other Animal Phyla?

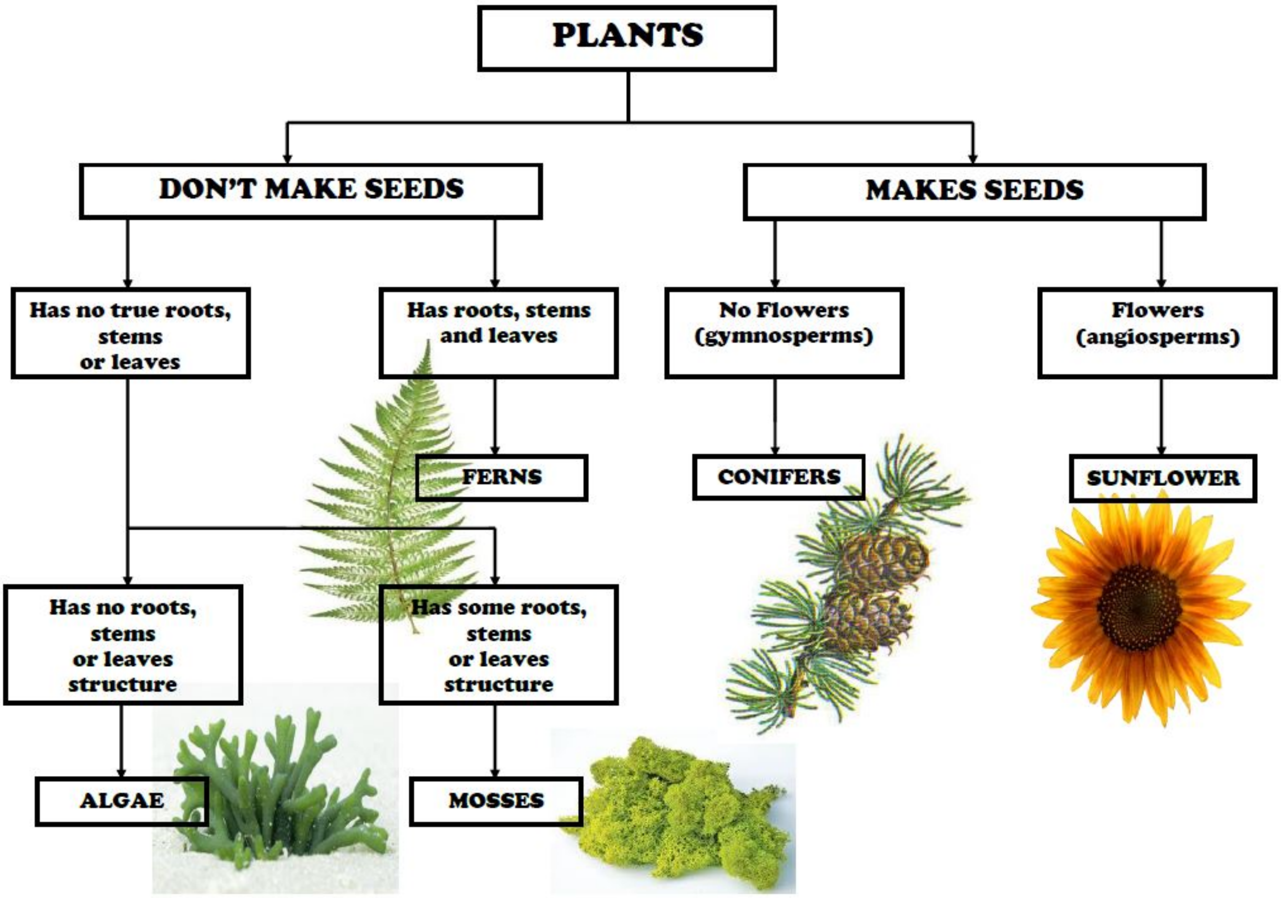
- Porifera & Cnidaria – sponges & corals.
- Platyhelminthes - flatworms, tapeworms
- Nematoda - roundworms
- Mollusca - clams, snails & slugs, squids
- Echinodermata - starfish, sea urchins
- Annelida - segmented worms (earthworms)
- Chordata - fish, amphibians, reptiles, birds, mammals

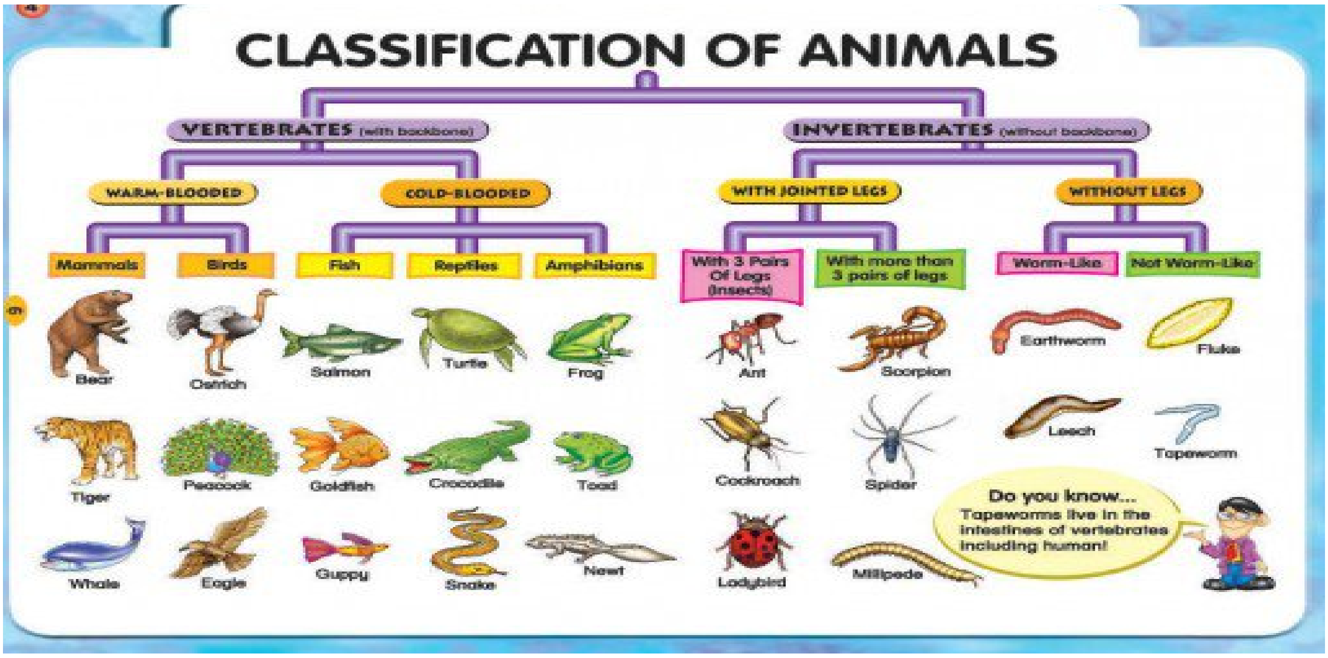
Classifying Living Things





A breakdown of more of each category is to follow on the next few slides


PLANTS
DON'T MAKE SEEDS
MAKES SEEDS
Has no true roots, stems or leaves
Has roots, stems and leaves
No Flowers (gymnosperms)
Flowers (angiosperms)
FERNS
CONIFERS
SUNFLOWER
Has no roots, stems or leaves structure
Has some roots, stems or leaves structure
ALGAE
MOSSES


CLASSIFICATION OF ANIMALS
VERTEBRATES (with backbone)
INVERTEBRATES (without backbone)
WARM-BLOODED
COLD-BLOODED
WITH JOINTED LEGS
WITHOUT LEGS
Mammals
Birds
Fish
Reptiles
Amphibians
With 3 Pairs Of Legs (Insects)
With more than 3 pairs of legs
Worm-Like
Not Worm-Like
Bear
Ostrich
Salmon
Turtle
Frog
Ant
Scorpion
Earthworm
Fluke
Tiger
Peacock
Goldfish
Crocodile
Toad
Cockroach
Spider
Leech
Tapeworm
Whale
Eagle
Guppy
Snake
Newt
Ladybird
Millipede
Do you know...
Tapeworms live in the intestines of vertebrates including human!

assification of Living things for Kids

Terms

Exoskeleton is a hard supporting structure on the outside of the body.

Example) lobster's shell.

Endoskeleton is a hard supporting structure on the inside of the body.

Example) bones

Primitive - was around at the beginning of time

Terrestrial - Lives on land

Aquatic - Lives in water

Species - Are living things that can breed together to produce offspring that can also breed together.

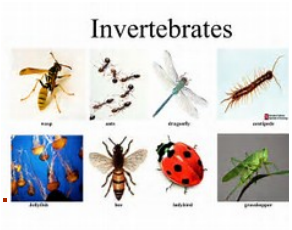
Ex) Cats can breed with other cats

(Cats cannot breed with a dog)

Animal Classification

Invertebrates - any animal that does not have a back bone.

Categories of Invertebrates (we will focus on are the following)



Sponges - are the most primitive of the animal groups.

-They live in water.

-They do not move from place to place.

-They filter tiny organism out of the water.

Coelenterates - are similar to sponges. They in water.

-They may or may not move from place to place.

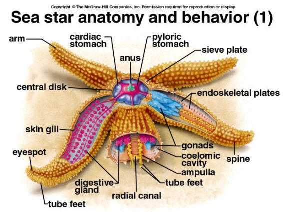
- They have stinging tentacles.

- Soft Bodies

- Reproduce by budding (growing small body part that falls off and grows into a new organism.

Ex) Jelly fish, anomes (where nemo lives)

Invertebrates Continued



Echinoderms - live in sea water

- Have internal skeletons

- Have suction pads to hold them in place

Ex) Star Fish, Sea Urchins, Sea Cucumbers

Worms - live in many different habitats

- Have soft long bodies

- May have appendages (legs) like a caterpillar

Ex) Flat Worm, Earth Worm, Round Worm

Arthropods - Have jointed legs or foot

- Have a hard outer shell (exoskeleton)

-most land spices are insects

-molt their skin/shell as they grow

-includes crustaceans (Shellfish)

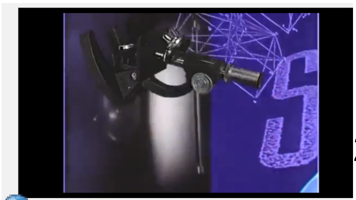
ex) Ants, spiders, lobsters, crabs

Invertebrate videos

ertebrates

invertebrates song

rtebrate Animals | Educational Video for Kids



22 min

Bill Nye the Science Guy S04E15 Invertebrates

rthropod?

Site for more info on invertebrates

http://www.biology4kids.com/files/invert_nematode.html

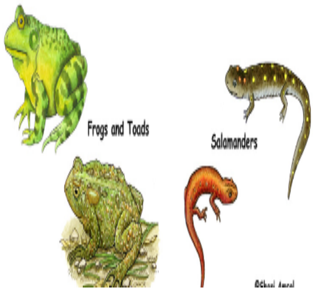
Animal Classification (Part 2)

Vertebrates- is any animal that has a backbone

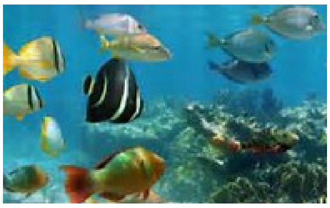
Categories of Vertebrates (we will focus on are the following):

Amphibians - are aquatic in early life cycle, but terrestrial as adults

- bony skeleton
- four limbs with webbed feet
- smooth, moist skin
- clod-blooded (ecothermal)
- Fertilization external in some (Frogs, toads) and internal in others (salamanders)
- Young receive no parental care



Fish - all are aquatic



- bony skeleton
- paired fins
- skin covered with scales in most species
- cold-blooded (ecothermal)
- Fertilization external in all
- Young receive no parental care

Animal Classification (Part 2)

Vertebrates continued

Reptiles - terrestrial, but many species spend time in the water

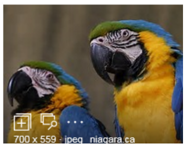
- bony skeletons
- paired limbs (except snakes & Lizards) with clawed toes
- scale-covered skin

-cold-blooded (eco-thermal)

-Fertilization internal

- Young receive some parental care (alligators) in some species

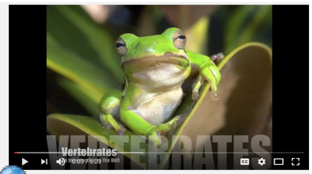
Birds - Terrestrial



- hollow boned skeleton

-paired limbs with the forelimbs as wings (some are not useful flight)

- Species adapted to flight
- warm blooded (endo-thermal)
- fertilization internal



rtebrates


Bill Nye The Science Guy on Reptiles (Full Clip)

33 min

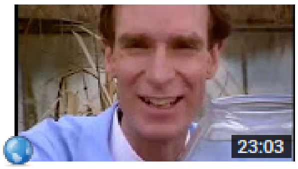

33 min

Bill Nye The Science Guy S03E13 Mammals

Cathrine RAELAL

1 year ago • 13,623 views


Bill Nye the Science Guy S03E18 Birds



Bill Nye the Science Guy S03E15 Fish

Bill Nye Fan

3,195 views

Habitat

- The place where an organism lives.
- Specific characteristics that the organism needs to survive.
- Typically, a species cannot survive for very long if their habitat changes too drastically.

Warm Blooded

Warm-blooded creatures, like mammals and birds, try to keep the inside of their bodies at a constant temperature.

They do this by generating their own heat when they are in a cooler environment, and by cooling themselves when they are in a hotter environment. To generate heat, warm-blooded animals convert the food that they eat into energy. They have to eat a lot of food, compared with cold-blooded animals, to maintain a constant body temperature. Only a small amount of the food that a warm-blooded animal eats is converted into body mass. The rest is used to fuel a constant body temperature.

Keep warm by having hair, fur, blubber, or feathers. They can also shiver to generate more heat when they get too cold and some migrate from colder to warmer regions in the winter.

To cool they sweat (Humans) or pant (dogs) or move into the shade or water.

Blubber is a special layer of fatty tissue that **animals** living in cold environments developed over time as a way of keeping warm.

Human Body Temperature is $37^{\circ}C$

Cold Blooded

Cold-blooded creatures, like reptiles often like to stay in the sun to warm up and increase their metabolism

They will expand their lungs to make them look larger so the sun will shine on more of their body to increase their temperature. Some can change color to either absorb or reflect light.

Autototrophs vs. Heterotrophs

Autotrophs (producers) capture energy from sunlight or chemicals to produce their own food.

ie/ plants

Organisms that rely on other organisms for their energy and food supply are called heterotrophs (consumers). These include animals, fungi and bacteria.

Heterotrophs

herbivore

carnivore

omnivore

detrivore

decomposers

scavenger

Herbivores, such as cows, obtain energy by eating only plants.
Carnivores, such as snakes and owls, eat only animals.
Omnivores, such as humans and bears, eat both plants and animals.
Detritivores, such as earthworms, feed on dead matter.
Decomposers, such as fungi, break down organic matter.
Scavengers, such as vultures, consume the carcasses of other animals.

Food chain is a step-by-step sequence linking organisms that feed on each other

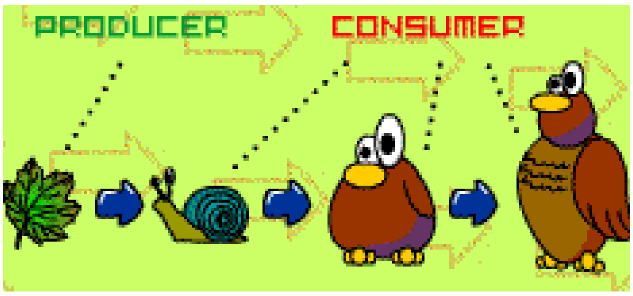
Producers get their nutrients from the soil, water and air.

Consumers feed on living or once living organisms as a source of energy and nutrients

Herbivores get nutrients when they eat producers.

Carnivores get nutrients when they eat herbivores.

Decomposers break down animal wastes and dead organisms.
The actions of decomposers release nutrients back into the soil, water and air so producers can use them again.



The_Vanishing_Frog_with_Jeff_Corwin.wmv

1.1

What would happen if frogs started to disappear?

- Declining frog populations would cause mosquito and fly populations to increase

- Declining tadpole populations would cause algae populations to increase this would cause serious environmental hardship

1.1

Why are Frogs disappearing?

- **loss of habitat**
  - human development has caused areas needed for frog populations to diminish
- **air and water quality**
  - Harmful bacteria forming
  - air pollution gets absorbed into the skin of a frog
  - reproduction rates decrease with increasing levels of acid rain
- **increased exposure to ultraviolet radiation**
  - high levels of UV radiation burns skin and damages skin cells
- **climate change**
  - higher temperatures are hard for frogs to adapt to

Animal Adaptation

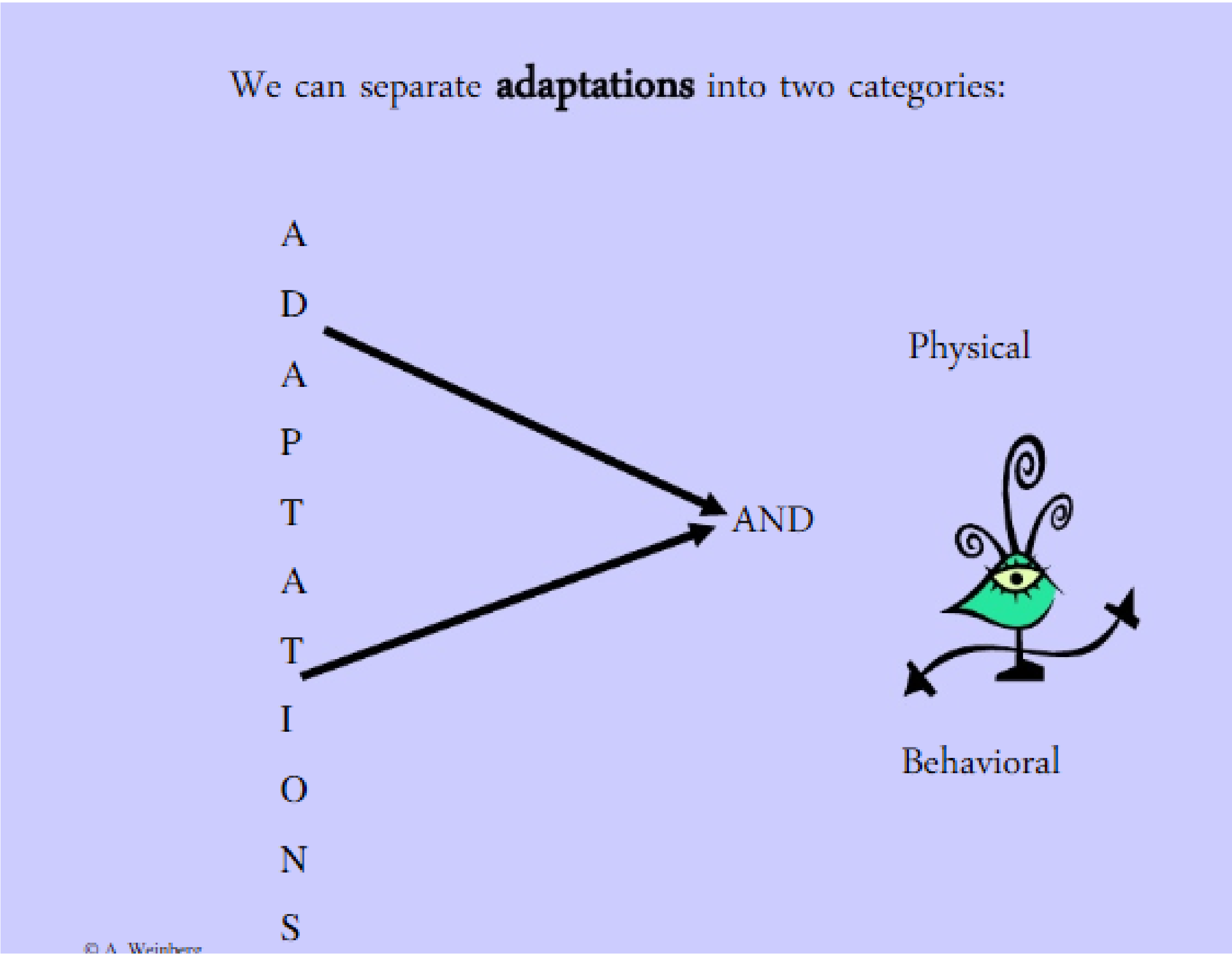
Have you ever wondered how animals are able to survive the wild?

Animals have certain adaptations that help them to survive.

Think about the way you dress in the winter.

You don't wear your shorts and bathing suit when it's snowing outside!

You wear warm clothes, and maybe even a hat and mittens to protect yourself from the weather.


We can separate **adaptations** into two categories:
A D A P T A T I O N S
AND
Physical
Behavioral
© A. Weinberg

Physical adaptations

are body structures that allow an animal to find and consume food, defend itself, and to reproduce its species.

Physical adaptations help an animal survive in its environment.

Physical adaptation

Camouflage (use of color in a surrounding)

The chameleon can change its color to match its surroundings.
Can **you** do that?

Physical adaptation

Mimicry

(looking or sounding like another living organism)

The Viceroy butterfly uses mimicry to look like the Monarch butterfly. Can you tell them apart?

Poisonous

I'm the Monarch!

I'm the Viceroy!

Not poisonous

Physical adaptation

Chemical defenses (like venom, ink, sprays)

Physical adaptations

Body coverings & parts (claws, beaks, feet, armor plates, skulls, teeth)

The elephant's trunk is a physical adaptation that helps it to clean itself, eat, drink, and to pick things up.

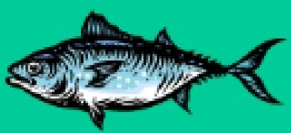
Now let's learn about

Behavioral Adaptations...

Behavioral Adaptations allow animals to respond to life needs.

We can divide **Behavioral Adaptations** into two groups:

Instinctive

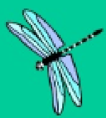


These behaviors happen naturally & don't have to be learned.

Learned

These behaviors must be taught.

Instinctive behaviors = happen naturally & don't need to be learned



Methods of gathering & storing food

Defending oneself

Hibernating

Finding shelter

Raising young

Migrating

Learned behaviors = Obtained by interacting with the environment and cannot be passed on to the next generation except by teaching.

Physical adaptations are body structures.

Some examples of physical adaptations are:

- Camouflage
- Mimicry
- Chemical defenses
- Body coverings & parts

Behavioral Adaptations are animals' actions.

Behavioral Adaptations can be

Instinctive or Learned.