

CHAPTER 13

In the past unit, you looked at the life cycles of plants and animals. However, there are many other kinds of organisms other than plants and animals in the world. How do scientists group all of them together? Let's find out...

In this unit you are going to look at **biodiversity** ("bi-o-di-vurs-ity"). Biodiversity means all of the different kinds of organisms that exist in the world, such as:

Plants, animals, bugs, mushrooms, pond slime...

Since there is so much biodiversity (different kinds of organisms) in the world, scientists place all of these organisms into groups. Placing organisms into groups is called **taxonomy**.

Think of taxonomy as a way of putting away your clean clothes. I would guess that you have organized your clothes before, right? Do you have a drawer for socks, how about one for pants? By putting your similar clothes (for

example, all of your socks) in its own drawer, you are putting your clothes into groups! Sorting your clothes into groups is an example of taxonomy!



DO YOU THINK THESE SOCKS GET SHOULD GET THEIR OWN DRAWER?

Scientists do the same thing with organisms. You have already learned a few of the groups. In the last unit you learned about reptiles, amphibians, Fish, birds, mammals, and insects. But... all of these groups of species are still animals right?

Scientists place all animals in the world into their own "drawer" called a **Kingdom**. These kingdoms are the largest groups that scientists have created to sort all living organisms. In fact, scientists have placed all organisms of the world into six different kingdoms:

Animal Kingdom

Plant Kingdom

Fungi Kingdom

("FLUN-GY")

Protista Kingdom

("PRO-TEES-TA")

Archaeobacteria Kingdom

("ARK-EE-BAK-TEAR-E-AH")

Eubacteria Kingdom

("U-BAK-TEAR-E-AH")

The first kingdom you are going to explore should be very familiar to you...

The Animal Kingdom



There is a lot of biodiversity in this kingdom! There are close to one million different kinds of animals that scientists have grouped into this kingdom.

However, there are two traits that make these organisms very similar:

First of all, most animals can move on their own. Second, Animals are **heterotrophic** ("het-er-o-tro-fick"). This means they cannot make their own food. A plant can make its own food inside itself. However, animals cannot do that!

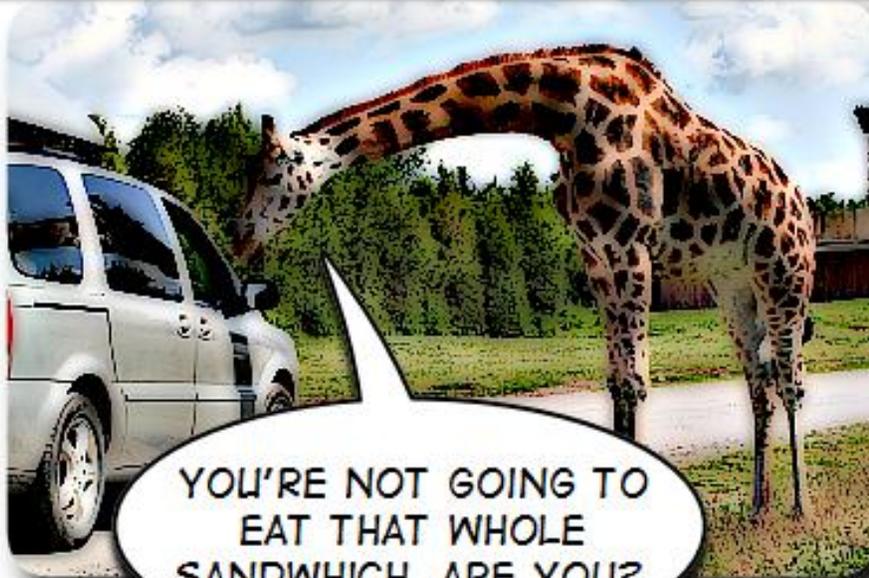
There are so many different kinds of animals with similar traits, scientists decided to **classify** (a word that means "to sort") into two smaller groups:

Vertebrates and Invertebrates

If you remember, **vertebrates** are animals that contain a backbone and have skeleton inside their bodies. Birds, fish, reptiles, amphibians and mammals are all vertebrates.

You may think that there are more vertebrates in the world than any other animal... but this is not true! Vertebrates are the easiest groups of creatures we can find because Most animals with backbones are large!

GIRAFFE'S HAVE A LONG BACKBONE. AND THEY ARE NOT AFRAID OF BEGGING FOR FOOD TOO...



Remember when we studied mammals in the last unit? Mammals are vertebrates, right? Let's take a look at some different groups of mammals:

Primates ("PRY-MATES")

Marsupials
("MAR-SOOP-EE-ALZ")

Rodents
AND **Cetaceans**
("SEE-TAH-SEE-ANZ")

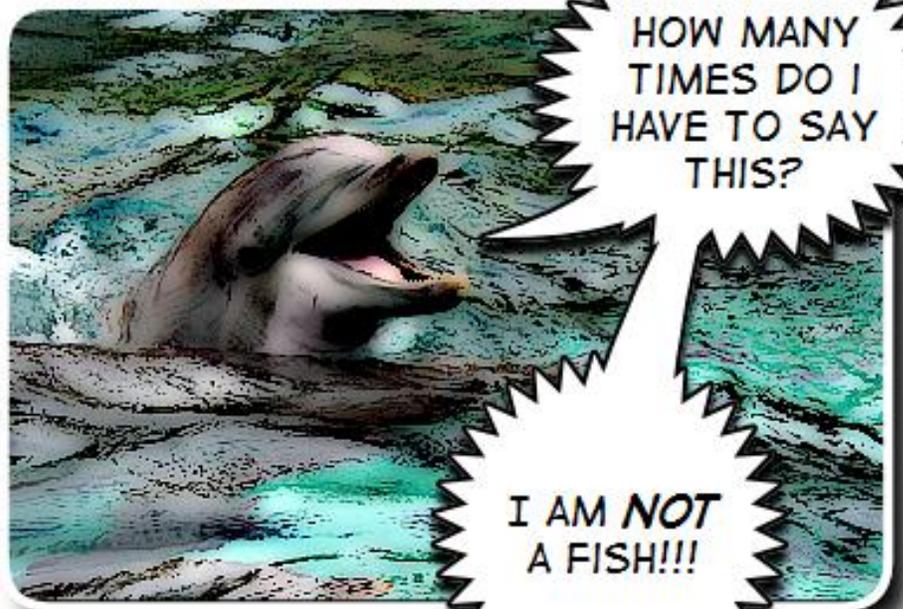
Primates are animals like the monkey, chimpanzee and gorilla. Many of these animals have very strong hands and fingers because of the use of thumbs. Primates also have very large brains that give them the ability to control and change their environment.



Marsupials are different from other vertebrates because they have a pouch on their body. They use this pouch to carry their children! There are two different marsupials ("mar-soop-ee-alz") you may have heard about - the kangaroo and the koala ("koe-ah-lah").

The word **rodent** means "gnawing animal". Mice, rats, gerbils, and squirrels are all different kinds of rodents. These organisms have sharp front teeth. They use their teeth to gnaw through hard foods like nuts and wood.

Cetaceans ("see-tah-see-anz") are found in aquatic biomes and are also known as whales and dolphins. These organisms are warm-blooded and they cannot breathe air under the water. So, these mammals must come to the surface of the water to breathe air. That's right! Whales and dolphins are not fish. They are mammals!



Remember!

There are not as many vertebrates in the world as there are **invertebrates**. Invertebrates do not have a backbone.



YOU MAY NOT WANT TO CHALLENGE A CRUSTACEAN TO AN ARM WRESTLING MATCH!

Most of the animal species in the world are invertebrates. In fact, most of these invertebrates are spiders, insects or **crustaceans** ("krus-tase-shun").

Crustaceans are animals like lobsters or crabs that have an exoskeleton and pinchers!

If you remember from the last chapter, an exoskeleton is a skeleton that is found outside of the body.

Many invertebrates, like spiders, insects or crustaceans, have exoskeletons and body parts (like arms and legs) that can move around... Just like humans!

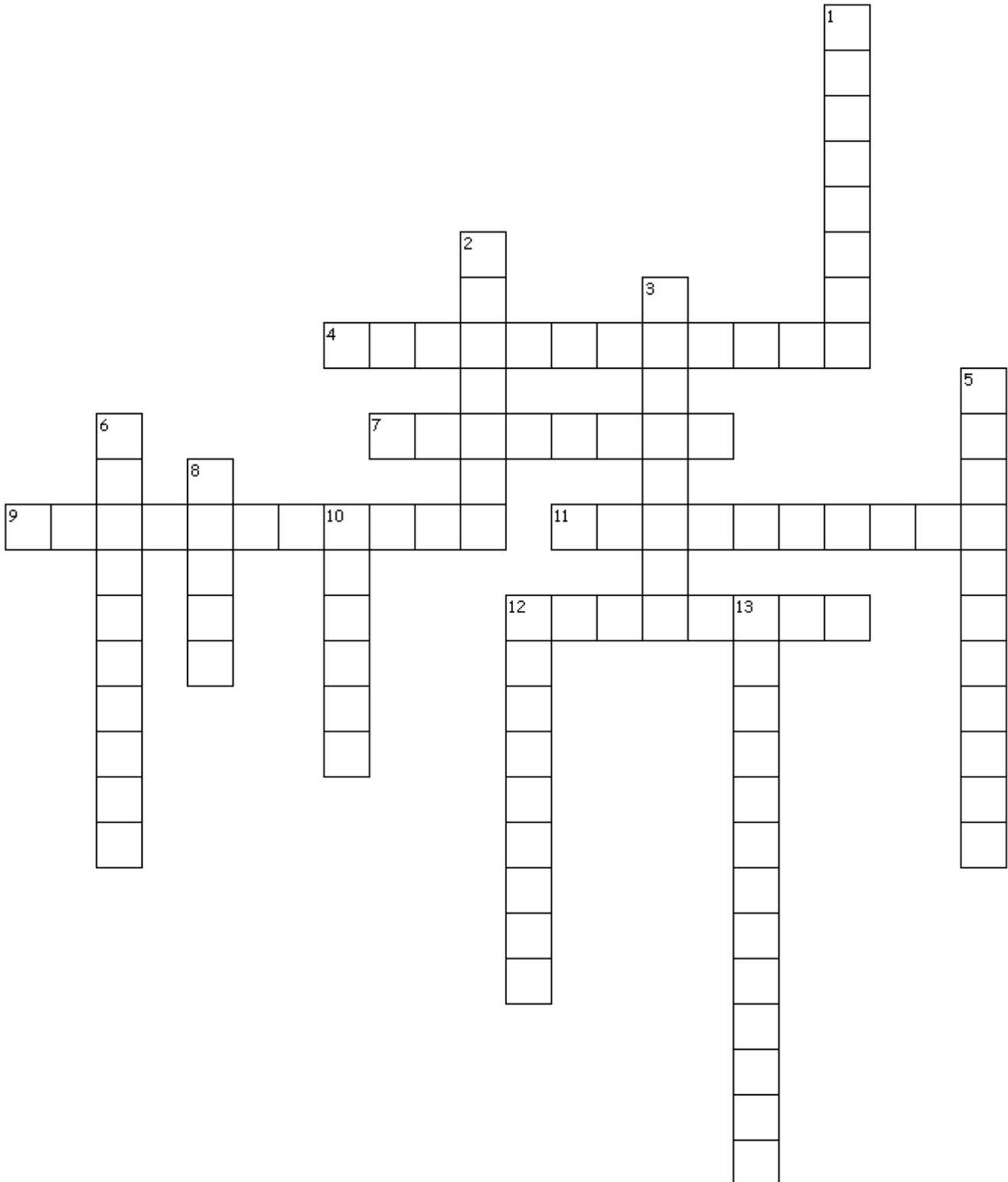
There are so many organisms like this that scientists have placed them into their own group: the **arthropods** ("r-throw-pods"). All arthropods have exoskeletons and body parts that help them to move.

There are, however, invertebrates that do not have an exoskeleton. One of these organisms is known as a jellyfish. This organism has no skeleton at all. The jellyfish forces water out of its body which causes it to move.

In the next chapter, you are going to look at another kind of organism I'm certain you have seen before...

Plants!

Place the answers to the following clues in the boxes below. Each box should contain one letter.



Across

4. all of the different kinds of life that exist on the world
7. six different groups that scientists have placed all living organisms into
9. animals that contain a backbone and have skeleton inside their bodies
11. the largest group of invertebrates that include spiders, insects and crustaceans
12. to group things

Down

1. the way scientists place all of the different organisms into groups
2. vertebrate animals like rats, mice and squirrels who have sharp front teeth used for gnawing
3. vertebrate animals like the monkey, baboon, chimpanzee and gorilla which have very strong hands and fingers because of the use of thumbs
5. animals like lobsters or crabs that have an exoskeleton and pinchers
6. vertebrate animals like the kangaroo or koala that have a pouch on their body for carrying their children
8. the smallest part of a living organism
10. in this kingdom most organisms can move on their own and are heterotrophic
12. these warm-blooded vertebrates (such as whales and dolphins) breathe air above the water
13. animals that do not have a backbone

Match the words in the first column to the best available answer in the second column.

- | | |
|----------------------|--|
| _____ Biodiversity | 1) six different groups that scientists have placed all living organisms into |
| _____ Taxonomy | 2) animals that contain a backbone and have skeleton inside their bodies |
| _____ Kingdoms | 3) the smallest part of a living organism |
| _____ Animal kingdom | 4) animals that have an exoskeleton and pinchers |
| _____ Cells | 5) most organisms in this kingdom can move on their own and are heterotrophic |
| _____ Classify | 6) vertebrate animals which have very strong hands and fingers because of the use of thumbs |
| _____ Vertebrates | 7) to group things |
| _____ Invertebrates | 8) vertebrate animals like the kangaroo or koala that have a pouch on their body for carrying their children |
| _____ Primates | 9) animals that do not have a backbone |

- _____ Marsupials 10) these warm-blooded vertebrates breathe air above the water
- _____ Rodent 11) vertebrate animals like who have sharp front teeth used for gnawing
- _____ Cetaceans 12) all of the different kinds of life that exist on the world
- _____ Crustaceans 13) the way scientists place all of the different organisms into groups
- _____ Arthropods 14) the largest group of invertebrates that include spiders and insects and crustaceans

Which one is right? Circle the correct answer.

1. Most animals are heterotrophic because they _____.

- a. choose not to make their own food
- b. use other organisms for food
- c. make their own food

2. What is the largest group that scientists place organisms?

- a. populations
- b. species
- c. kingdoms

3. Which of the following organisms are all vertebrates?

- a. birds, fish, insects and reptiles
- b. fish, amphibians, reptiles and primates
- c. fish, amphibians, reptiles and spiders

4. Which type of organism contains a pouch to carry its babies?

- a. marsupials
- b. cetaceans
- c. primates

5. The number of invertebrates in the world _____.

- a. is about the same as the number of vertebrates
- b. is more than the number of vertebrates
- c. is less than the number of vertebrates

6. Which of the following organisms are all arthropods?

- a. spiders, insects and crustaceans
- b. spiders, mice and crustaceans
- c. spiders, lobsters and rodents

CHAPTER 14

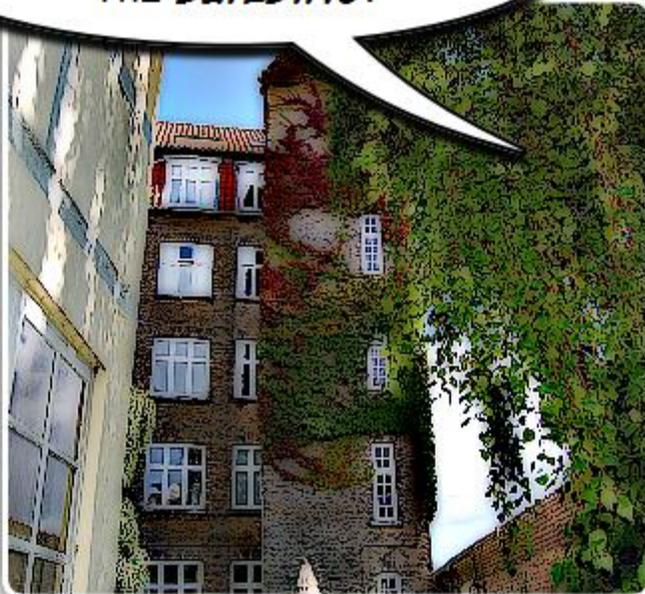
In the last chapter, you learned how scientists classify organisms in a process called taxonomy. All living organisms have been classified into six different kingdoms. The first kingdom you explored was the animal kingdom. In this chapter, you will study the plant kingdom.

As you learned from the last chapter, taxonomy has been used for a long time. The Greek thinker Aristotle classified organisms in two groups - animals and plants...

...over 2,000 years ago!

As scientists found new organisms, they made new groups to classify these new organisms. These new groups became the six kingdoms we use today to classify living organisms.

JUST A FEW MORE DAYS
EVERYONE AND WE'LL TAKE OVER
THE *BUILDING!*



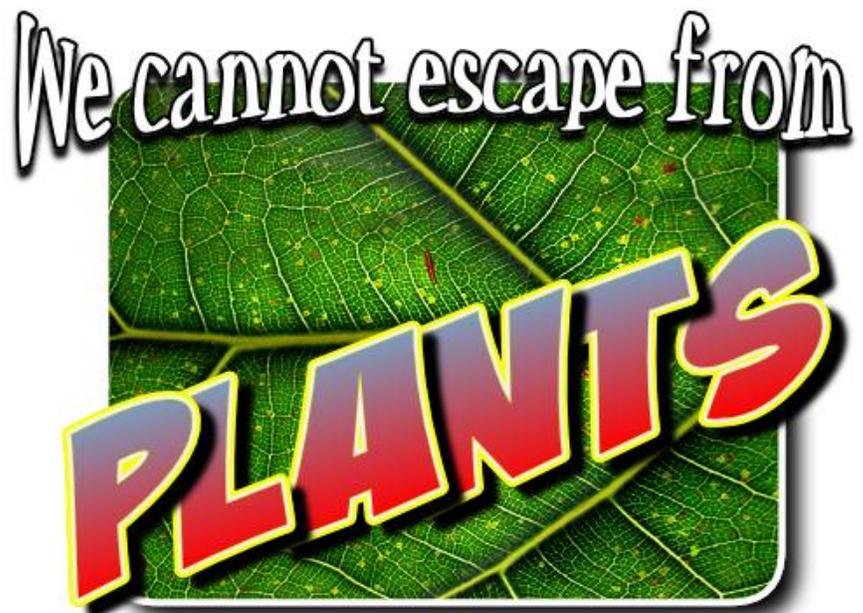
Now you are going to look at the second kingdom of life...

The Plant Kingdom

Can you think of a place you have ever visited that did not have any plants at all? I doubt many of you can do this! Plants are everywhere!

Our lives depend on plants! They are used for food and shelter. They also give us most of the air we need to breathe!

Because there are so many kinds of plants, the biodiversity of plants is huge! Each biome, you have learned about, has different kinds of grasses, trees and shrubs!



The most important trait for all plants is that they are **autotrophic** ("ah-tow-tro-fick"). This means that they make their own food. Remember... It is the leaves of a plant that make its food in a process called photosynthesis. This makes plants different from animals, as you know that animals cannot make their own food. They are heterotrophic.

Plants can be sorted into two different groups:

Nonvascular plants ("non-vas-q-ler")

and

Vascular plants ("vas-q-ler")

Nonvascular plants do not have body parts to move water from their roots to the stem and to the leaves. In order to get the water they need to survive, they have to absorb (soak up) water through their body (just like a sponge!)

There are many different kinds of nonvascular plants. One kind of nonvascular plant that you can easily see is a **moss**. Mosses cannot move water from their roots to their stems and leaves. They absorb water, like a sponge, through their roots, stems and leaves! Most of the time, you will find mosses growing in damp places. Since water cannot be moved from the roots to the stems or the leaves, the roots of a moss never get very big. This is different from the roots of a tree, which can get very large!



Remember...

The roots of a moss cannot move water to the rest of the plant! Their main job is to attach the moss to soil, rocks or other plants!

Now on to a much larger group of plants...

The Vascular Plants!

Vascular plants can move water from their roots to the stem and to the leaves. Most of the plants you have seen in your life are vascular plants and they can be sorted into two different groups:

Non-Flowering plants and Flowering plants

Let's take a look at the non-flowering vascular plants first...

Ferns are a kind of **non-flowering vascular plant**. Ferns never produce flowers but they do have a stem. The stem moves water from its roots to the rest of the plant.

But if ferns have no flowers, how do they grow any seeds?

Because ferns, like many other plants, are different. They do not need to grow seeds to reproduce! They can drop their leaves onto the ground and grow a new plant! Not all non-flowering vascular plants are very small. Some of them can be very large, like a tree...

Conifer trees are another kind of Nonflowering vascular plant. The conifer is like the fern because it does not produce flowers!

However, conifers do produce seeds!

You learned in chapter six that conifers make pinecones. Pinecones are the seeds that are produced by conifers! Most of the coniferous forest biome contains plants that are conifers!





Now, let's explore some flowering vascular plants!

Most of the plants that you are used to seeing are **flowering vascular plants!** Flowers are very important to these plants because this is where the fruits and seeds are grown. Without the flowers, they could not produce the fruits or seeds. This would be a big problem for their life cycle. Without fruits and seeds, they could not produce new plants!

Most of our fruits, vegetables, trees, grasses and shrubs all come from flowering vascular plants!

Some vascular plants, like mint and poison ivy, can grow a new plant from their roots. The areas of the roots where these new plants begin to grow are called **rhizomes** ("ri-zomes").

Circle the hidden words from below:

F K M P K N B T L C M C G D X
 L L S O Y H c E O C I K C I C
 M Z O B S A D N K H C U W F W
 G O G W L S I C P F E R N S V
 N S D P E F X O X I X X L D A
 I L S G E R R B G D R H Q H S
 R T T R N T I M F S S P T E C
 E V S V O I T N G J T A B Z U
 W U I T N O K A G Q N X C X L
 O Y U G H Y I Z Z K A N Y S A
 L A N O N V A S C U L A R N R
 F K V O Z L T B V E P G T G J
 N S E M O Z I H R J R D D Y C
 O H M N T M W Y B E G R S B G
 N B P J Q E T T A L U I U B J

AUTOTROPHIC
FLOWERING
NON-FLOWERING
PLANTS

CONIFERS
KINGDOM
NONVASCULAR
RHIZOMES

FERNS
MOSS

Match the words in the first column to the best available answer in the second column.

- | | |
|----------------------------|--|
| _____ Plant kingdom | 1) plants without body parts to move water from their roots to the stem and to the leaves |
| _____ Autotrophic | 2) special areas on a plant's root that can grow a new plant |
| _____ Nonvascular plants | 3) nonflowering vascular plants which never produce flowers |
| _____ Moss | 4) plants with special body parts that move water from their roots to the stem and to the leaves |
| _____ Vascular plants | 5) vascular plants that make flowers |
| _____ Non-Flowering plants | 6) one kind of nonvascular plant that can absorb water with its entire body |

- _____ Flowering plants 7) non-flowering vascular plants
which never produce flowers but
do produce seeds
- _____ Ferns 8) vascular plants that do not make
flowers
- _____ Conifers 9) being able to make your own food
- _____ Rhizomes 10) a group of organisms that are
autotrophic and have some form of
leaf and stem and root

CHAPTER 15

In the last chapter, you reviewed a little about taxonomy and you also explored the plant kingdom. This week, you will be studying two more kingdoms. The first one is called...

Kingdom Fungi

("fun-guy")

Mushrooms are a species of fungi. Many of you have probably seen a mushroom before, right? If you haven't seen one on the ground, you may have seen a picture of this organism which looks like an umbrella! You may be thinking that a mushroom is more like a plant than an animal, right? **Nope!**

All species of fungi are relatives of both plants and animals.

The umbrella-shaped mushroom is really the **flower** of a fungus! Fungi do not make food for themselves, like plants do! This makes fungi **heterotrophic**, much like animals!



Before you start imagining a mushroom moving around like an animal and eating its food, let's get something straight. Fungi, like the mushroom, cannot move. To eat they have to absorb their nutrients through their body like a sponge.

But how do they do that?



Fungi can live on the ground, on a tree or on another organism! They spread a "sticky goo" from their body onto the area they live.

This "goo" contains chemicals, called **enzymes** ("n-zimes"). Enzymes do all kinds of things for an organism. The enzyme that fungi make can break up biotic material into smaller parts that the mushroom can absorb. This is how a mushroom can eat its nutrients! The enzymes that fungi spread around their habitat are very important for all living organisms...

...not just the mushroom itself!

Fungi are known as **decomposers**. Decomposers break down biotic material (anything that comes from an organism – living or dead) into more useful forms (like nutrients for living plants!)

Fungi break down so much biotic material into smaller parts, that they cannot absorb it all! The leftover nutrients that are not used by the fungi can be used by other plants and animals in the habitat.

Let's try to imagine a forest without any fungi:



Get a picture of a forest in your head. Now some of those trees fall down, right? Without decomposers like fungi living in that forest, where would all those fallen trees go?

They wouldn't go anywhere!

They would still be there, right? Without fungi, there would be piles and piles of dead trees lying around...

So how would a new plant grow with piles of dead trees in the way?

If the ground is covered with dead trees, how will new plants get any sunlight? And without decomposers breaking down biotic material in your forest, where will new plants get their nutrients?

You guessed it, they won't!

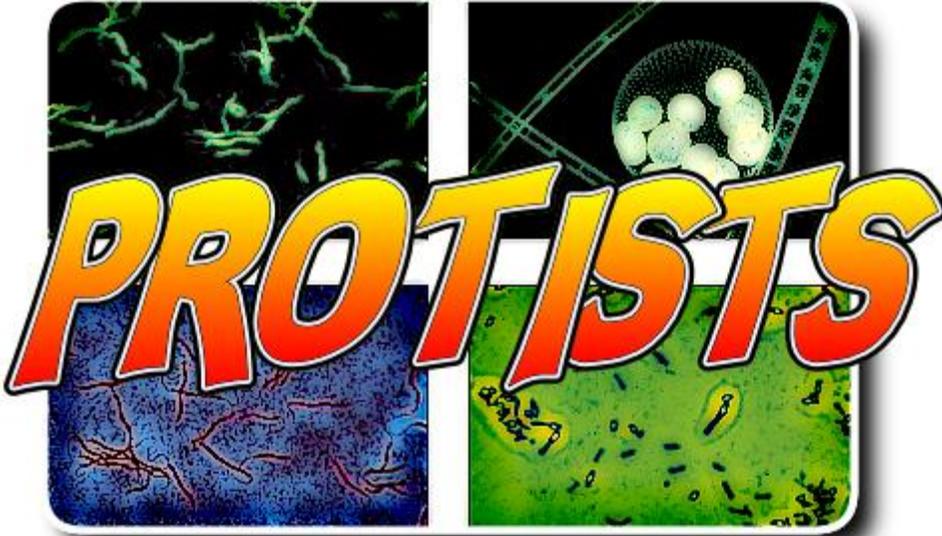
Every habitat must have a large number of decomposers to break down the biotic material for new organisms to survive. The second kingdom you are going to look at this week is a little different. It is known as...

Kingdom Protista

("pro-tees-ta")

All of the organisms in this kingdom, known as **protists**, have been placed into this kingdom because...

nobody knows what to do with them!



Each species of protist have a combination of traits from plants, animals and fungi! Scientists put them into this kingdom because

each species does not fit perfectly into the plant, animal or fungi kingdoms. For example, scientists have sorted most of the protists into three groups:

Slime molds - Fungus-like protists

Algae ("al-gee") - Plant-like protists

and **Protozoans** ("pro-toe-zo-unz") - Animal-like protists

These three groups have been made to sort protists by how they get their food. **Slime molds** are fungus-like protists because they absorb nutrients from their habitat.

Algae are plant-like protists. They are autotrophic, so they make their own food. You may have seen algae... it is usually called **seaweed**. If you have ever been in a lake or pond and had that green, gooey slime attached to you, it was probably algae!

Protozoans are the animal-like protists. They are heterotrophic, so they tend to get their food. Protozoans mostly live in aquatic biomes. Some protozoans can make you very sick!

That is why is it not such a good idea to drink water right out of a lake or river!



There is a problem with sorting protists according to how they get their food!

Some protists are both autotrophic and heterotrophic!

That's right! Some protists eat their food and make their own food as well! Confusing, isn't it? Most scientists do not even agree on which group to place these organisms! They are still trying to figure this out!

Many protists that are grouped together still have different traits. This is not like the organisms in the animal, plant and fungi kingdoms!



Fill in the blanks with the correct letters. The words in the list on the right provide a clue to the answer.

- | | |
|-----------------------------|---|
| 1) pr _ tozoa _ _ | animal-like protists |
| 2) d _ compose _ _ | organisms that break down biotic material into more useful forms |
| 3) _ lg _ e | plant-like protists |
| 4) ki _ gdom p _ _ _ is _ a | organisms that share traits with plants and animals and fungi |
| 5) _ ingdo _ fun _ _ | organisms that act as decomposers and absorb their food through their bodies |
| 6) e _ zy _ _ s | chemicals made by organisms that can help the organism do many different things |
| 7) slime _ _ ld _ | fungus-like protists |

Match the words in the first column to the best available answer in the second column.

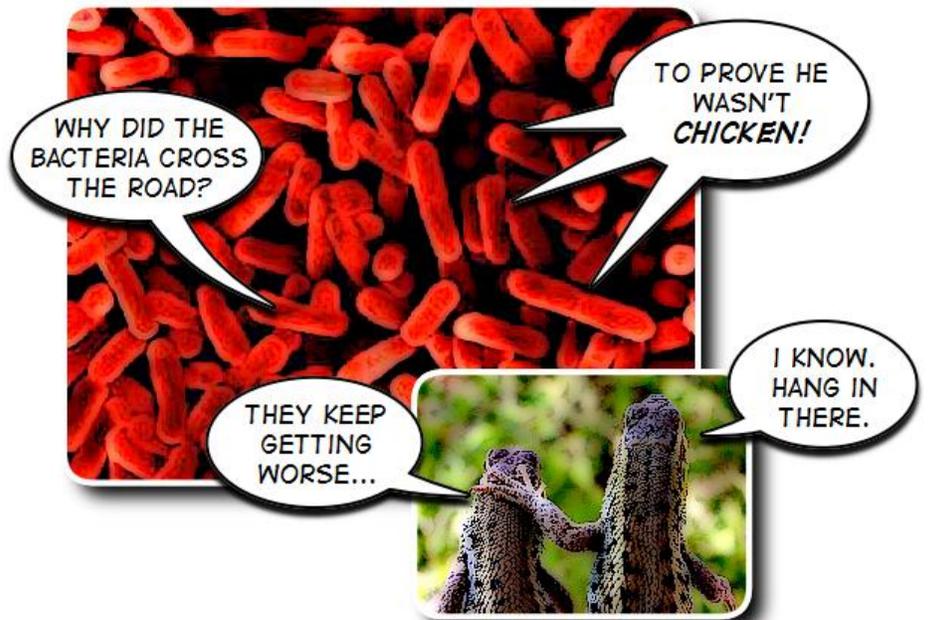
- | | |
|---------------------------------|---|
| _____ Kingdom
_____ Fungi | 1) plant-like protists |
| _____ Enzymes | 2) organisms that share traits with plants and animals and fungi |
| _____ Decomposers | 3) organisms that break down biotic material (like dead plants and animals) into more useful forms (like nutrients for living plants) |
| _____ Kingdom
_____ Protista | 4) animal-like protists |
| _____ Slime molds | 5) chemicals made by organisms that can help the organism do many different things |
| _____ Algae | 6) fungus-like protists |
| _____ Protozoans | 7) organisms that act as decomposers and absorb their food through their bodies |

CHAPTER 16

In the last chapters, you have explored four different kingdoms: Animals, Plants, Fungi and Protista. The biodiversity of life in these kingdoms is huge! However, we are not yet done. There are two more kingdoms to study.

Both of these kingdoms contain organisms known as **bacteria**. Bacteria are very small organisms that live in soil, water, and other organisms. Bacteria can be found in every biome! They can even be found in places you would never expect to find any kind of life!

In fact, there are probably several thousand bacteria on this book! Some bacteria are even living in you right now!



Don't panic!

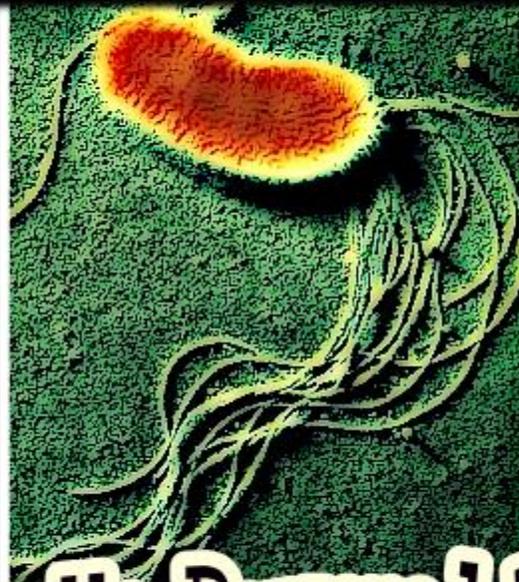
Without bacteria living in your body you would not be alive for very long!

Bacteria reproduce by splitting in half to form a new organism. In addition, Some bacteria can move on their own. They have a body part called a **flagella** ("fla-gel-ah"). A flagella acts like a tail that moves the bacteria through a liquid.

Since we owe our lives to these small organisms, let's start exploring them...

The first kingdom of bacteria you will study this week is called...

BE THE FIRST BACTERIA ON THE BLOCK TO HAVE YOUR VERY OWN...



Flagella-Powered Engine!

Kingdom Archaeobacteria

I know it is a big word, just relax and say...
"ark-ee-back-tear-e-ah"

The bacteria in this kingdom live in areas of the world where no other organisms can live.

These organisms were first discovered in places like the hot springs of Yellowstone National Park, Wyoming. These hot springs are areas where boiling hot water comes out of the earth all day long.

GRAND PRISMATIC SPRING - YELLOWSTONE NATIONAL PARK, WYOMING



Yep! That water is boiling hot!

Until this time, nobody thought that organisms could live in such a hot habitat. Since then, scientists started looking in areas where they also did not think life could exist.

The results of this search found several different kinds of bacteria that can be sorted into three groups:

Methanogens ("meth-an-o-gens")

Halophiles ("hal-o-files")

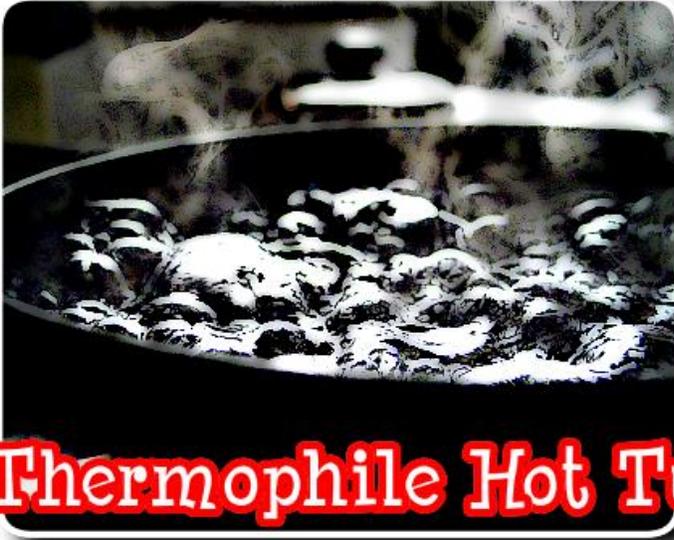
and **Thermophiles** ("therm-o-files")

Methanogens are named after the gas they make – **methane**! Methane is the gas that is commonly used to heat homes.

Methanogens live in places where the gas we need to breathe (called **oxygen** - "ox-e-jen") cannot be found. In fact, if these bacteria were placed in the air we breathe, they would die!! Methanogens can be found in many places, like the bottom of swamps or sewage treatment plants. They are even found inside many organisms including humans!

Halophiles are also known as "salt lovers". These bacteria live in very salty water. Places like the Dead Sea and the Great Salt Lake are home to halophiles. Most of these bacteria are autotrophic, so they make their own food! If you placed a halophile in a glass of water from the faucet, it would not survive! This organism uses salt to create food for itself!

Thermophiles are also known as "heat lovers". These bacteria live in areas with very high temperatures. The bacteria found in the hot springs of Yellowstone national park are thermophiles! In addition to hot springs, these organisms have been found in underground caves near volcanoes!



A Thermophile Hot Tub!

The last kingdom you are going to study may be the most misunderstood group of organisms...

Kingdom Eubacteria

This is another big word, I know! Just relax and say...
"you-back-tear-ee-ah"

Do you see anything similar in this kingdom's name? You guessed it! This is another kingdom of **bacteria!**

Bacteria can live anywhere! Archaeobacteria have inherited traits that make them live in habitats where no other organism can. However, most eubacteria can live in any biome you have studied!

There are millions of eubacteria in a single teaspoon of soil. They are on your skin, in your hair, all over the door knobs of your house! And yes, they even live inside you! Most of these organisms are harmless to humans, so do not worry!

Let's look at some of the good things that come from eubacteria:

- Bacteria are used to make many different kinds of foods such as cheese, pickles and yogurt.



- In soil, bacteria act as **decomposers** by breaking down biotic materials into more useful forms... just like fungi!
- Bacteria are used to grow various medicines.
- In the human body, some bacteria help to keep us well and to digest our food!

However, it is too bad that some other kinds of bacteria cause diseases in every kingdom.

Plants, animals, fungi and protists can all become sick when certain species of bacteria grow inside them!

Bacteria can grow very quickly if they are given the right amount of resources (like heat, water and nutrients). Because of this, it is hard for an organism to defend itself from getting sick when bacteria are growing inside of them.

Scientists are adding new species to each of the six kingdoms of life you have studied so far. As new living creatures are found and new traits are discovered, scientists are working to classify all of these organisms!

Science is always changing because scientists are always searching for new information about the world we live in!



This means that you must keep asking questions about the world around you and keep looking for the answers!

The table below contains words and phrases that have been chopped in half. Find the pieces that fit together and write them in the answer area below.

oxy	flag	Metha	kingdom arc
kingdom e	nogens	haebacteria	ella
ubacteria	Halop	gen	hiles
thermo	Bact	eria	philes

Answers:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Match the words in the first column to the best available answer in the second column.

- | | |
|----------------------------------|--|
| _____ Bacteria | 1) bacteria that live in very dangerous habitats |
| _____ Flagella | 2) single celled organisms that can live in soil and water and other organisms |
| _____ Kingdom
Archaeobacteria | 3) common bacteria that can live in every biome of the world |
| _____ Methanogens | 4) archaeobacteria that live in areas with very high temperatures |
| _____ Halophiles | 5) the gas humans need to breathe to stay alive |
| _____ Thermophiles | 6) body part of a bacteria that acts like a tail which moves the bacteria through a liquid |
| _____ Oxygen | 7) archaeobacteria that live in very salty water |
| _____ Kingdom
Eubacteria | 8) archaeobacteria named after the gas they make - methane |

Unit Four review

Fill in the blanks in the story below with the following words:

decomposers
autotrophic
heterotrophic

Since I am _____, I have to eat other organisms to stay alive! This is much different than plants who are _____. Other organisms, called _____, break down all kinds of biotic material into more useful forms.

Match the words in the first column to the best available answer in the second column.

- | | | |
|-------|-----------------|---|
| _____ | Plants | 1) a group of organisms that can move on their own and are heterotrophic |
| _____ | Fungi | 2) common bacteria that can live in every biome of the world |
| _____ | Animals | 3) organisms that act as decomposers and absorb their food through their bodies |
| _____ | Protists | 4) bacteria that live in very dangerous habitats |
| _____ | Archaeobacteria | 5) organisms that share traits with plants and animals and fungi |
| _____ | Eubacteria | 6) a group of organisms that are autotrophic and have some form of leaf and stem and root |

Be certain to go over your definitions for the test!