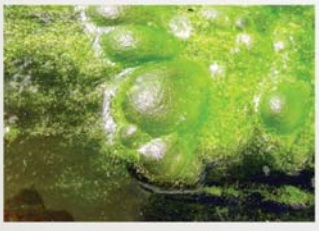
Protist

Euglena

- Made up of one cell that has a nucleus
- Found in freshwater and marine environments
- Moves by using a flagellum, a whiplike tail that propels it forward
- Makes its own food by photosynthesis and engulfs food particles found in its environment
- Reproduces asexually

Protist

Algae



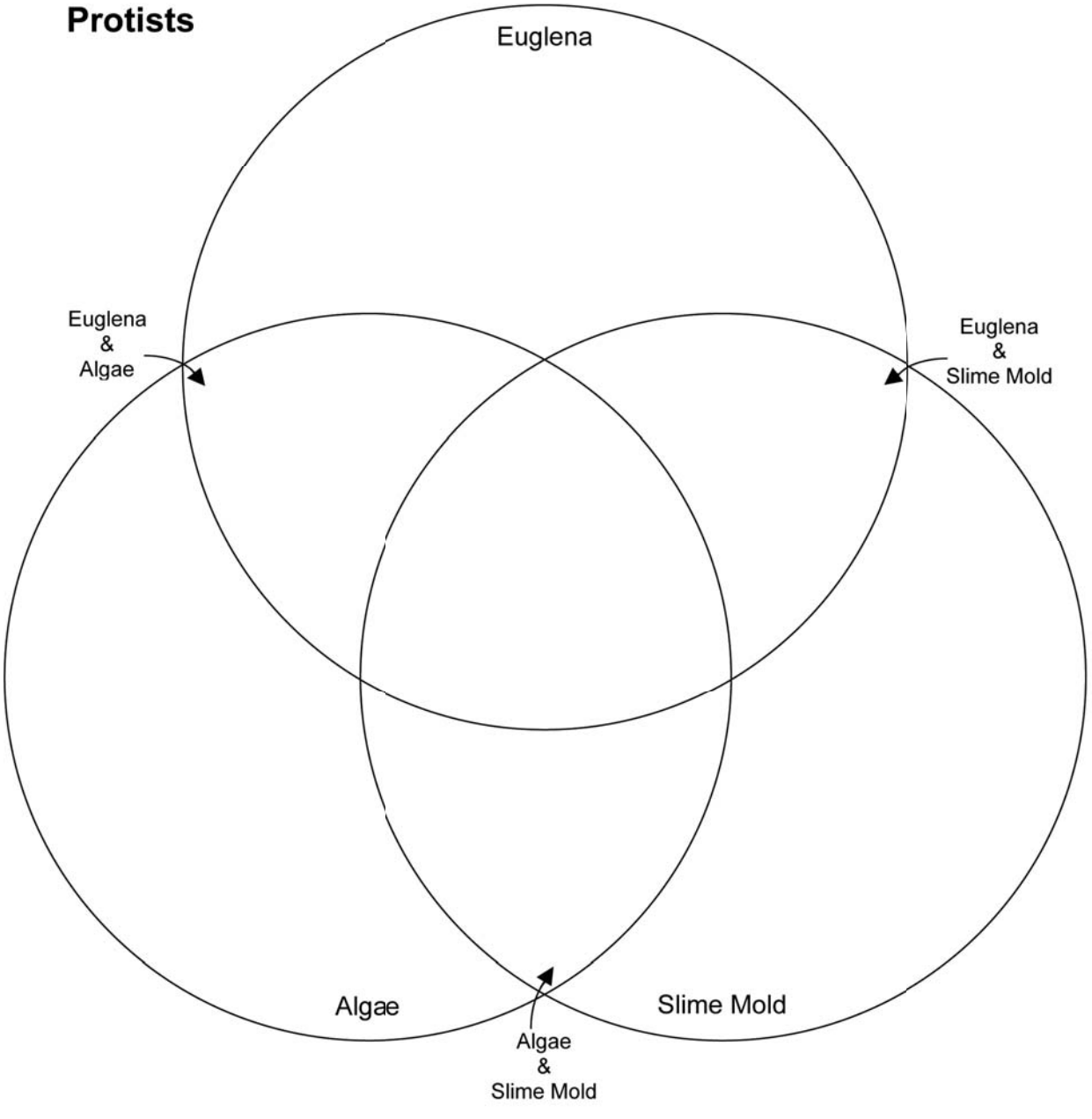
- Made up of one or more cells; each cell has a nucleus
- Found in freshwater and marine environments
- Some are mobile and have flagella
- Makes its own food by photosynthesis and absorbs nutrients from its environment
- Reproduces asexually and sexually

Protist

Slime Molds

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

Holt: Cells, Heredity, and Classification
Chapter 7
Part 1 -- Compare Kingdoms



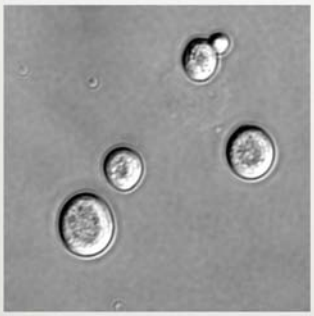
Destroying angel

Fungus

- Made up of many cells; each cell has at least one nucleus
- Found on land, usually near trees or shrubs
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually and sexually
- Extremely poisonous

Yeast

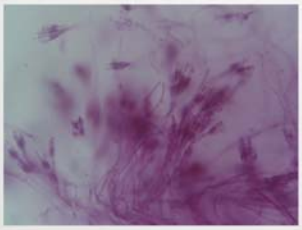
Fungus



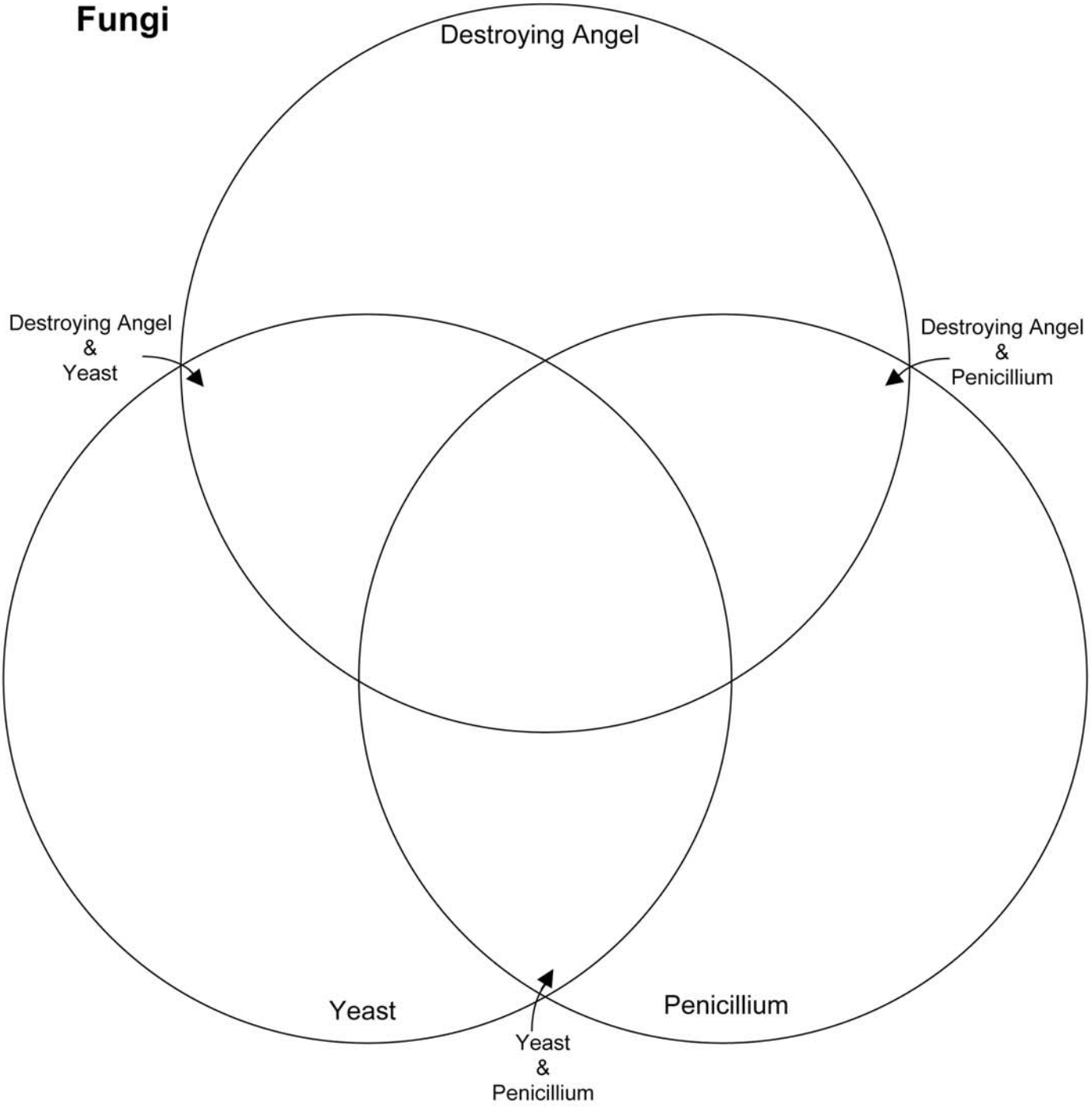
- Made up of one cell that has a nucleus
- Found on land and in freshwater and marine environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually or sexually
- Used in baking bread and brewing beer

Penicillium

Fungus



- Made up of many cells; each cell has a nucleus
- Found on land; often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin


Fungi
Destroying Angel
Destroying Angel & Yeast
Destroying Angel & Penicillium
Yeast
Penicillium
Yeast & Penicillium

Animal

Tyrannosaurus rex

- Made up of many different kinds of cells; each cell had a nucleus.
- Found on land, 65 to 68 million years ago
- Moved by walking upright
- Fed on animals found in its environment
- Reproduced sexually

Animal

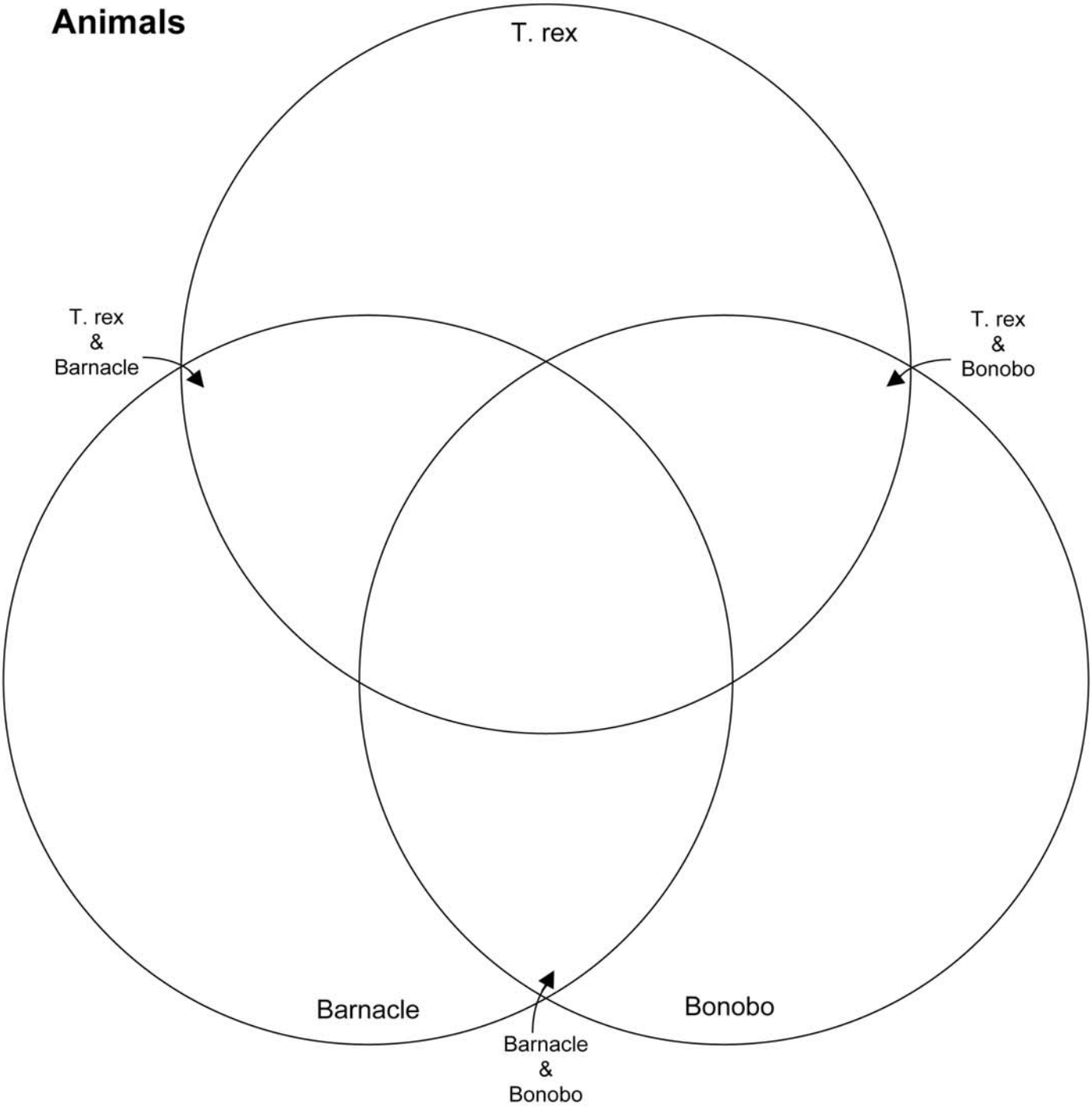
Barnacle

- Made up of many different kinds of cells; each cell has a nucleus
- Found in marine environments; attached to hard substances
- Moves by swimming when young; adults are immobile
- Feeds on plankton found in its environment
- Reproduces sexually

Animal

Bonobo

- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually


Animals
T. rex
T. rex & Barnacle
T. rex & Bonobo
Barnacle
Bonobo
Barnacle & Bonobo

Plant

Cactus

- Made up of many different kinds of cells; each cell has a nucleus and a cell wall
- Found on land, in desert environments
- Immobile
- Makes its own food by photosynthesis
- Reproduces sexually

Plant

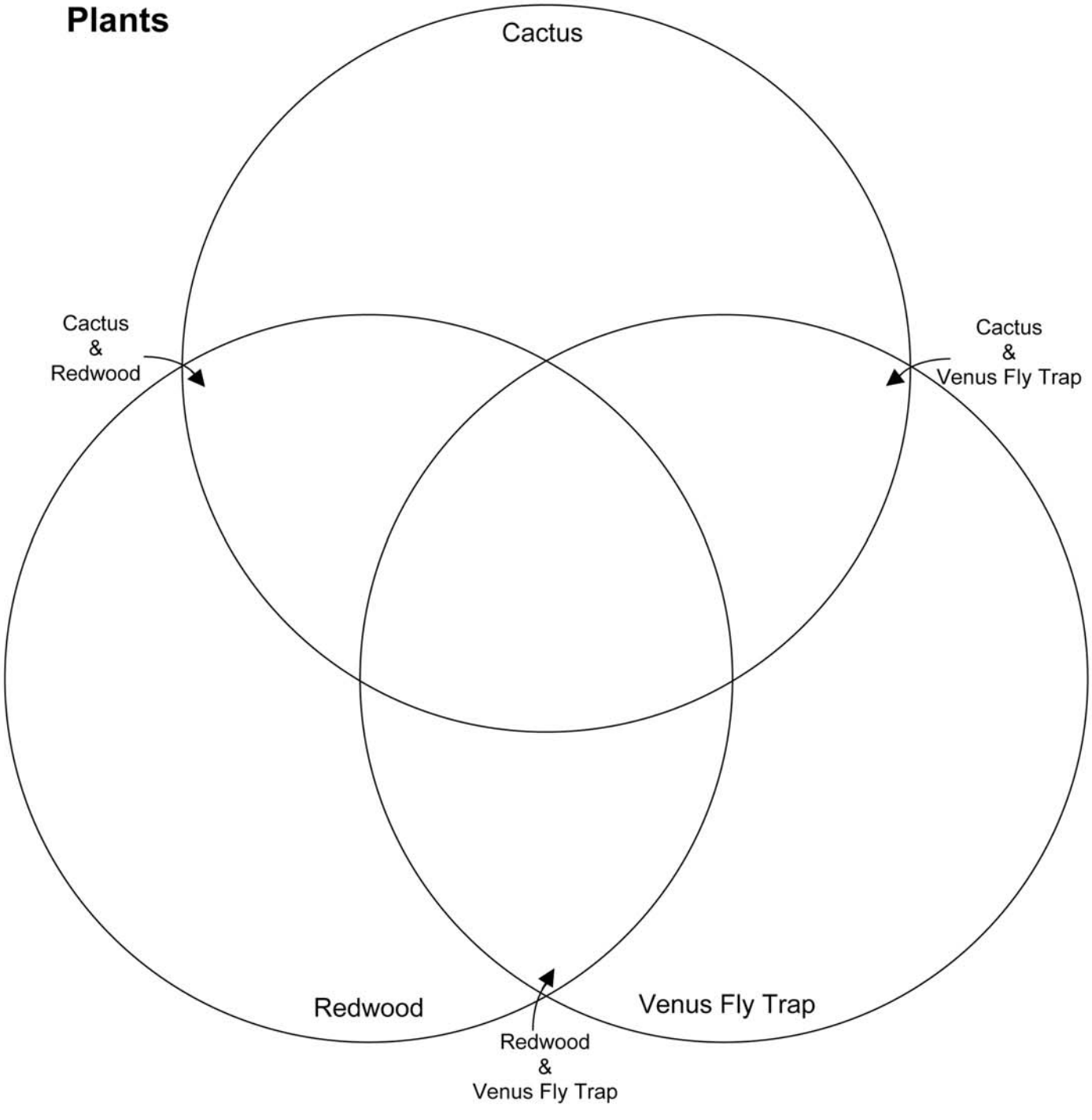
Redwood

- Made up of many different kinds of cells; each cell has a nucelus and a cell wall.
- Found on land, in forests and parks in California and Oregon
- Immobile
- Makes its own food by photosynthesis
- Reproduces sexually

Plant

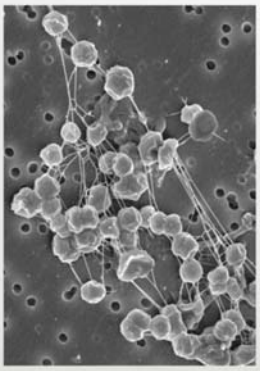
Venus fly trap

- Made up of many different kinds of cells; each cell has a nucelus and a cell wall
- Found on land, in wet sandy soils
- Immobile
- Makes its own food by photosynthesis and feeds on insects found in its environment
- Reproduces sexually


Plants
Cactus
Cactus
&
Redwood
Cactus
&
Venus Fly Trap
Redwood
Venus Fly Trap
Redwood
&
Venus Fly Trap

Archaea

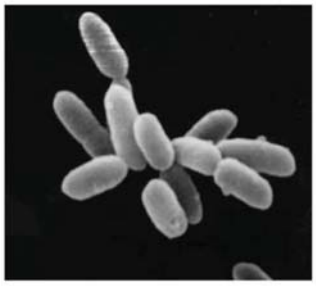
Methanogen



- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments; common in wetlands and in human and animal intestines
- Moves by using a flagellum
- Metabolizes carbon dioxide and hydrogen found in its environment
- Reproduces asexually

Archaea

Halobacteria



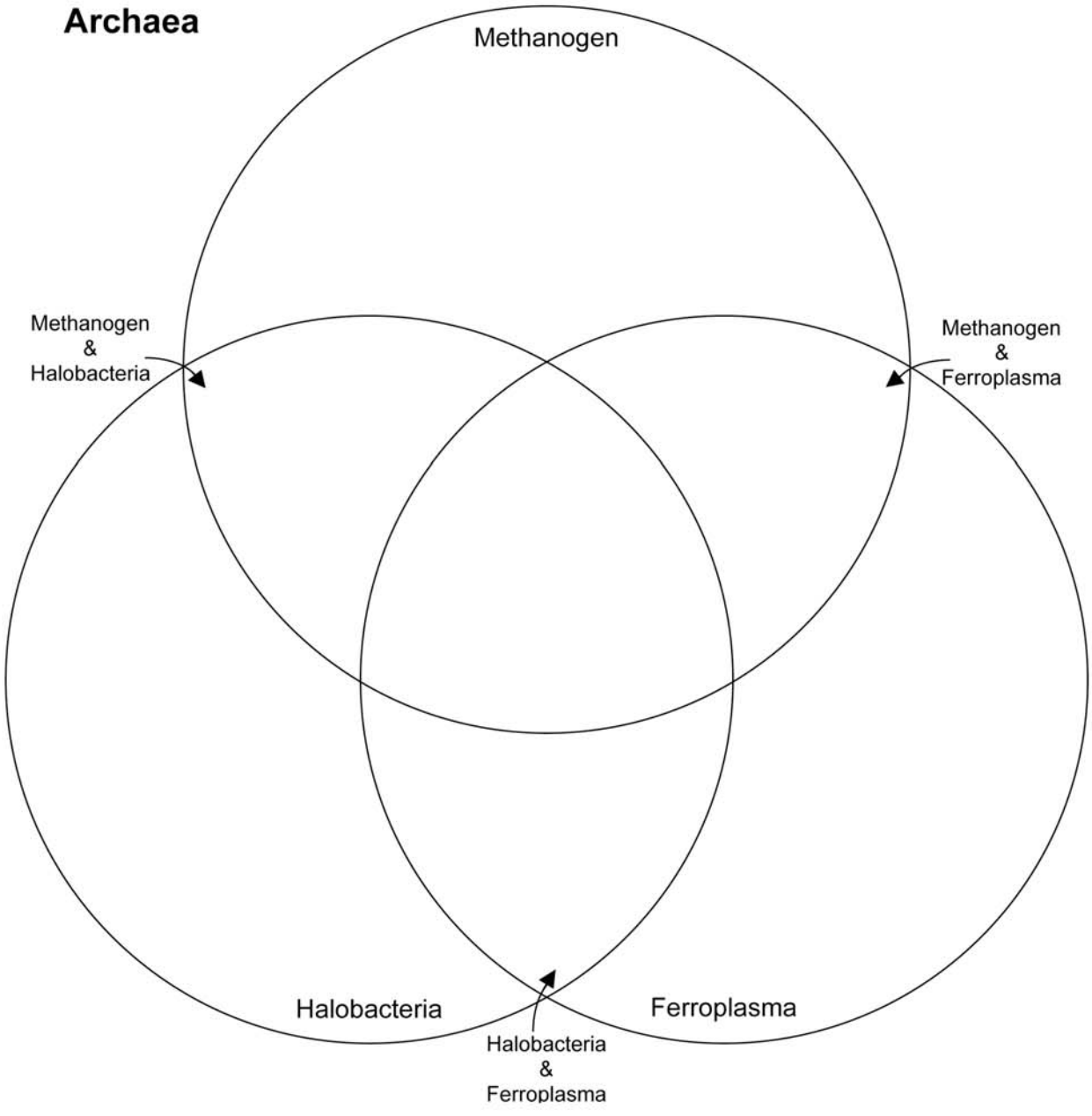
- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely salty environments
- Moves by using a flagellum
- Metabolizes amino acids found in its environment and makes its own food by photosynthesis
- Reproduces asexually

Archaea

Ferroplasma

- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely acidic environments; common in mine drainage sites
- Moves by using a flagellum
- Metabolizes iron found in its environment
- Reproduces asexually

Holt: Cells, Heredity, and Classification
Chapter 7
Part 2 -- Compare Domains



Bacteria

Streptococcus

- Made up of one cell that has a cell wall but not a nucleus
- Found in acidic environments; common in human and animal mouths and throats
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

Bacteria

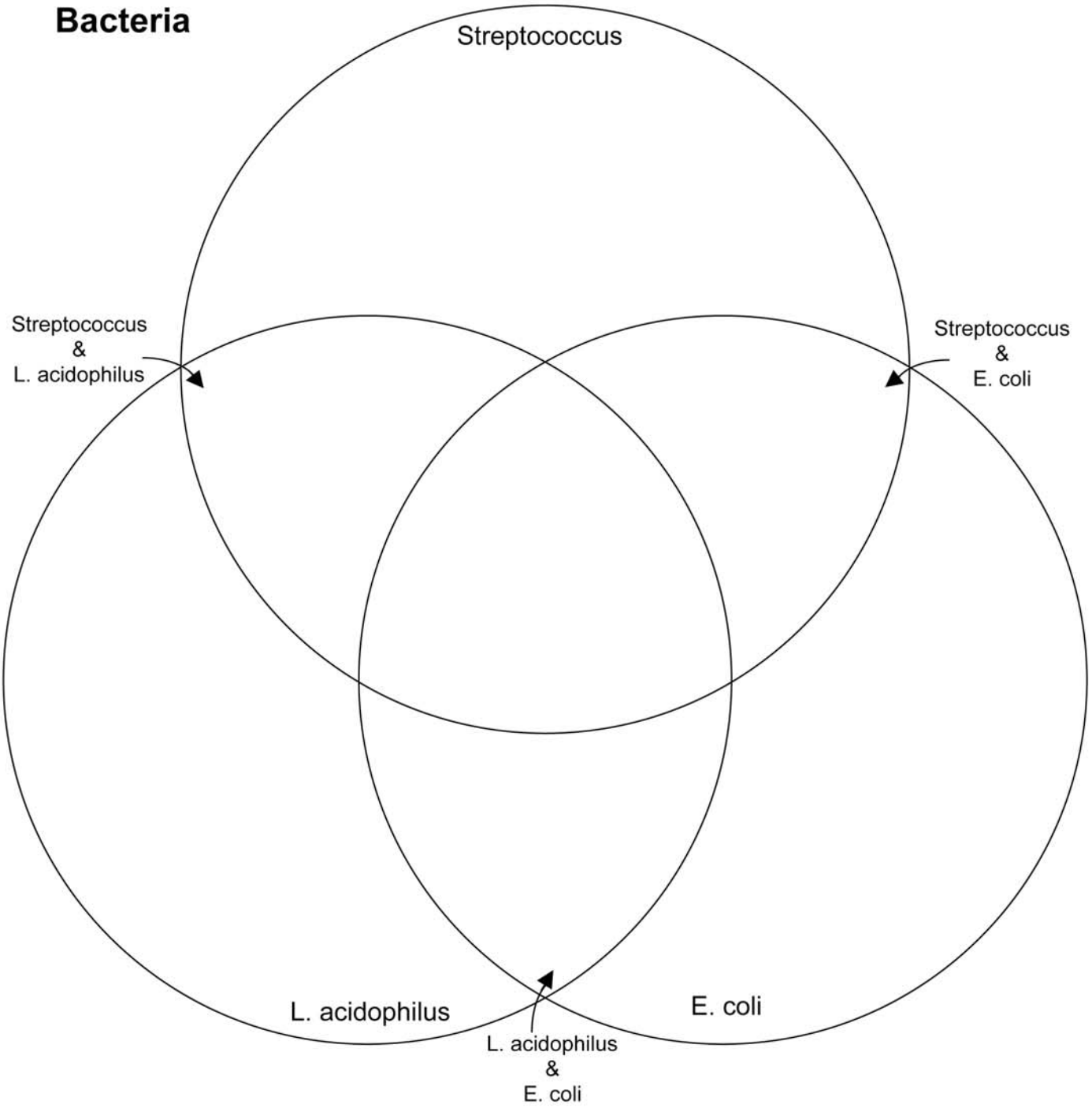
L. acidophilus

- Made up of one cell that has a cell wall but not a nucleus
- Found in warm, acidic environments, common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

Bacteria

E. coli

- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments; common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually


Bacteria
Streptococcus
Streptococcus
&
L. acidophilus
Streptococcus
&
E. coli
L. acidophilus
E. coli
L. acidophilus
&
E. coli

Eukarya

Slime molds

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

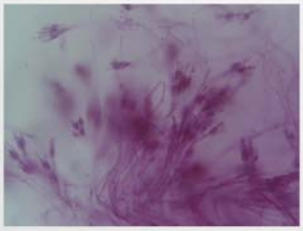
Eukarya

Bonobo

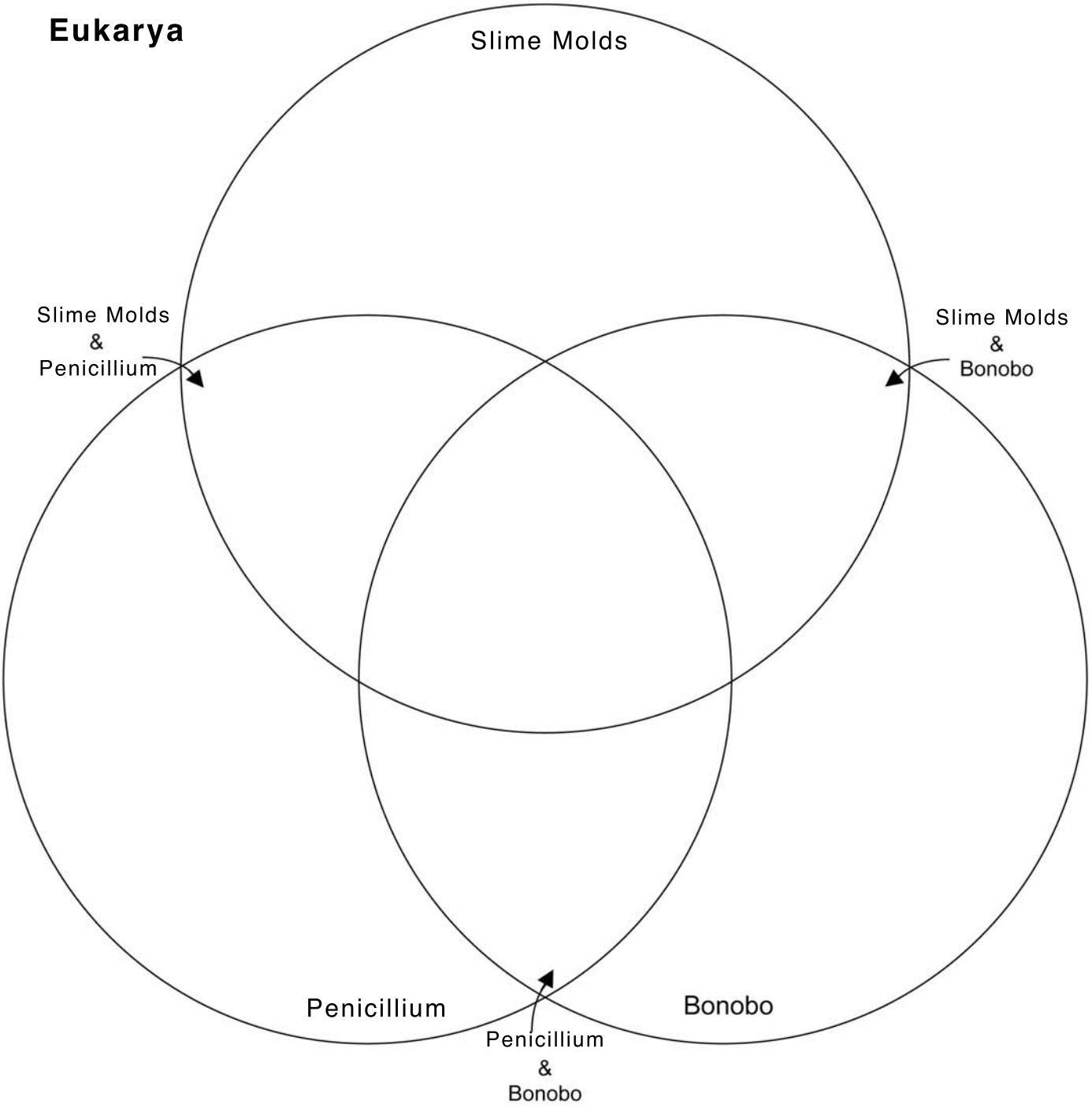
- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually

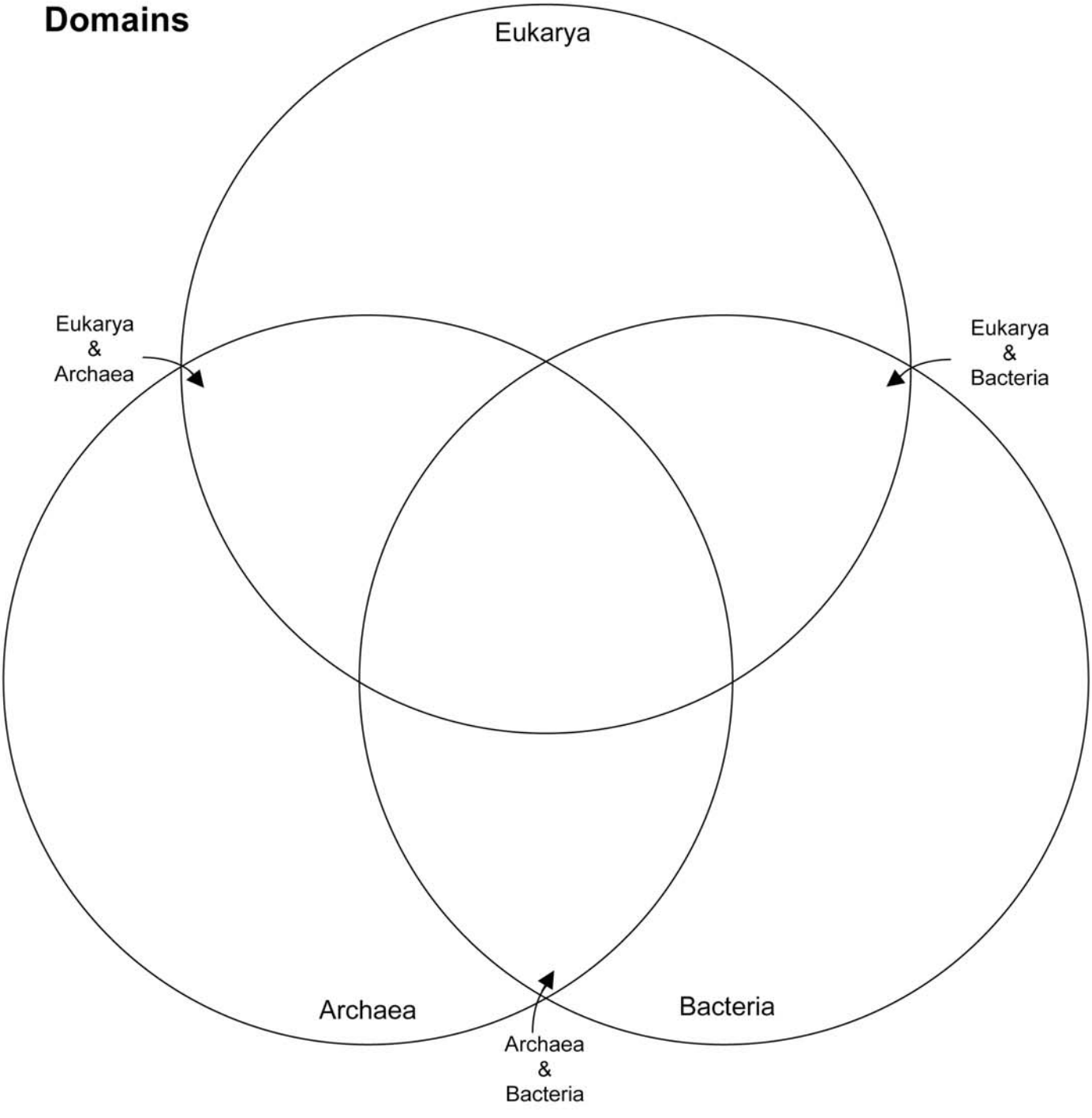
Eukarya

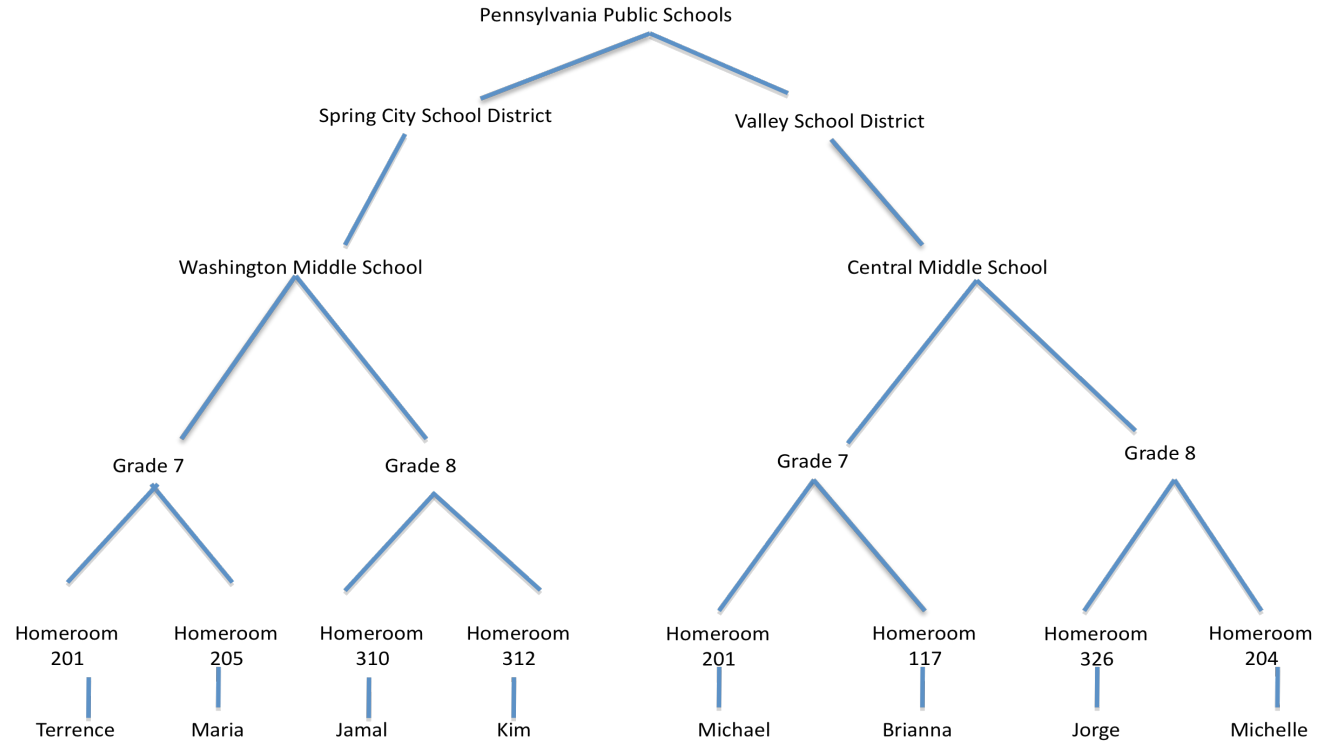
Penicillium



- Made up of many cells; each cell has a nucleus
- Found on land, often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin

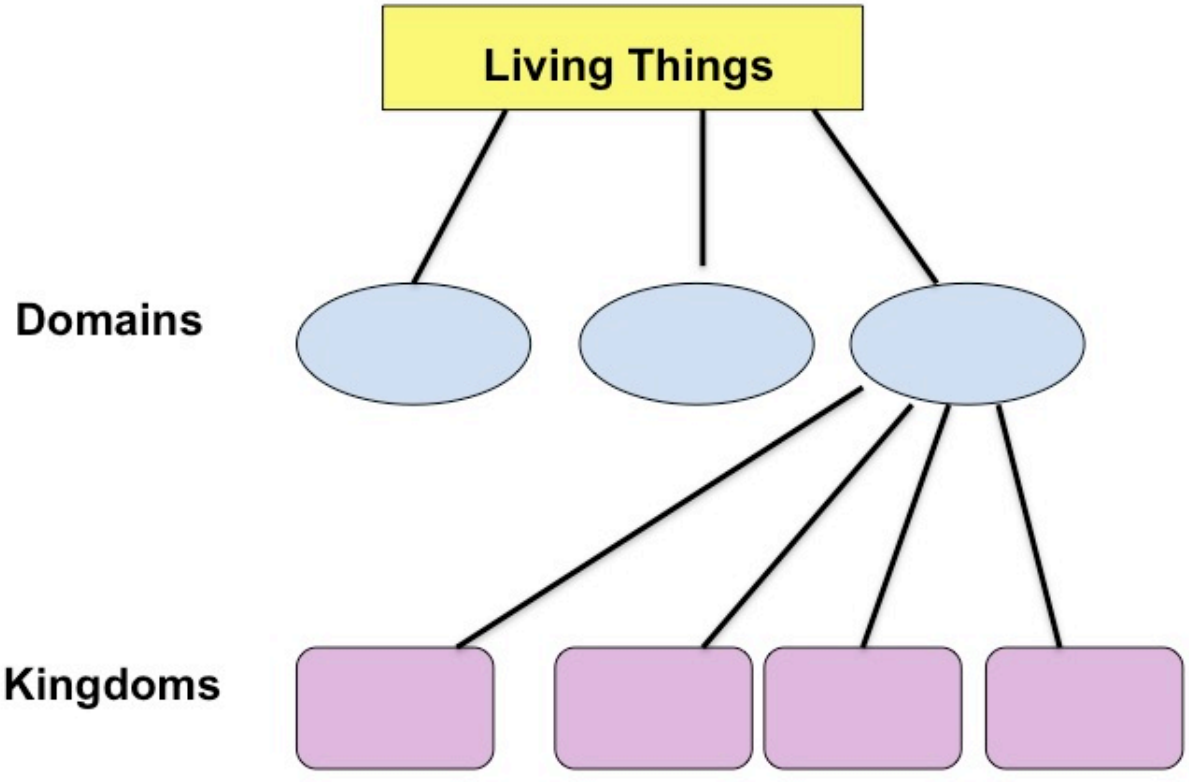

Eukarya
Slime Molds
Slime Molds & Penicillium
Slime Molds & Bonobo
Penicillium
Bonobo
Penicillium & Bonobo


Domains
Eukarya
Eukarya & Archaea
Eukarya & Bacteria
Archaea
Bacteria
Archaea & Bacteria



	What do you know for sure?	What might be true?
What can you figure out about Brianna?		
If you know that another student (who belongs in this chart) attends Washington Middle School, what else can you figure out about him or her?		
If you know that a student is in Grade 7 on this chart, what else can you figure out about him or her?		
A new 8th grader comes to Central Middle School. What other students might be in their homeroom?		

Could you move Michael to the same spot Terrence on the chart, since they are both in Homeroom 201? Why or why not?



Categories to be placed in the chart: **Protista, Bacteria, Fungi, Archaea, Animalia, Eukarya, Plantae**

After you have finished the chart, use it to answer the following questions:

1. If you know something is a protist, what else can you say about it?

2. If something is a member of the domain Eukarya, could it be a plant?

3. If something is an animal, could it be a member of the domain Archaea?

4. If something is a living thing, does it have to be an animal?

Selective Breeding – Case 1

All dogs (Canis familiaris) come from a single ancestor, the grey wolf (Canis lupus). Over the past 15,000 years humans have selectively bred dogs to have particular characteristics and traits (height, size, weight, color, type of ear, herding or hunting behaviors, etc.). We now have over 200 breeds of dogs. Dog breeders select dogs to mate based on some set of desired characteristics or traits. For example, huskies were bred for certain traits including: medium size, thick fur coat, and high energy because they were needed for pulling sleds over long distances in extremely cold climates. The huskies with the desired characteristics were *bred* and passed their genes on to their offspring. The pups were born with combinations of the parents' genes. The huskies that showed the desired traits were then selected for the next round of breeding. Pups that were born with undesired traits such as small size or low energy were not selected for breeding. With each new generation, the dog breeders continued to select for the desired traits - medium sizes, thick fur coat, and high energy.

Why are there so many different breeds of dogs today?

Case comparison handout 1

1. What changed in terms of the dogs reproducing**?**

2. What changed in the characteristics of the dogs over time**?**

3. What features did breeders select for?

4. Which organisms get to reproduce?

Selective Breeding – Case 2

Several kinds of vegetables (broccoli, cauliflower, cabbage, Brussels sprouts, kale, kohlrabi) come from a single ancestor, one species of plant called wild mustard. Over the past several thousand years humans have selectively bred the wild mustard plant for different characteristics or traits to create other types of vegetables. Farmers select plants to reproduce based on some desired set of characteristics. For example, broccoli was bred for large flower clusters and a short stalk. The plants showed the desired characteristics were *bred* and passed their genes on to their offspring. The offspring (seedlings) inherited combinations of the parents' genes. The plants that showed the desired traits (large flower clusters and a short stalk) were then selected for the next round of breeding. Plants with undesired traits (small flower clusters or long stalks) were not selected for reproduction. With each new generation the farmers continue to select for increases in the desired characteristics - larger flower clusters and shorter stalks.

Why do we have broccoli plants today?

Case comparison handout 2

1. What changed in terms of the broccoli reproducing?

2. What changed in the characteristics of the broccoli over time?

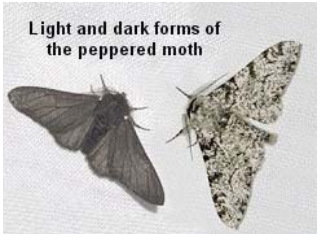
3. What features did breeders select for?

4. Which organisms get to reproduce?

Across the cases:

Question	Case 1: Dogs	Case 2: Broccoli
How did the patterns of reproduction within each species change?		
What changed in the characteristics of the dogs and the broccoli plants over time?		
Why did those changes occur?		
What (who) determines which organisms reproduce?		

Natural Selection – Case 1



The peppered moth evolution is an example of natural selection. The peppered moth varies in wing color from light to dark. In the early 1800's the peppered moth population had mostly light colored wings. The wing color served as a type of camouflage that protected them from bird predators because they were similar in color to the light-colored birch trees that they rested on and therefore were hard to see. In contrast, moths with darker wings were easier to see on the light colored trees (see above) and therefore less likely to survive The birds could see and eat them. The moths with light colored wings were better able to survive and were thus more likely to reproduce, passing their genes to their offspring who were then also likely to have light colored wings. The moths with darkly colored wings were not as likely to survive and thus were less likely to pass their genes on to the next generation. After several generations, the light winged moths outnumbered the dark winged moths.

However, things changed during the Industrial Revolution (late 1800's) because the pollution from the factories changed the environment. Many of the light colored trees became dark with soot (black smoke) from the pollution. Therefore, the dark colored moths now became better camouflaged than the light colored moths. The dark colored moths were now better able to survive, reproduce and pass on their genes to their offspring. The light colored moths now were easier to see on the darkened trees and be eaten by the birds. After several generations, the dark winged moths outnumbered the light winged moths.

What caused the number of light colored moths as compared to the number of dark colored moths to change over several generations?

_____

_____

_____

In the 1900's, pollution laws were made and factories had to install cleaner smokestacks. This decreased the amount of soot being put into the air. What do you think happened?

_____

_____

_____

Case comparison handout 1

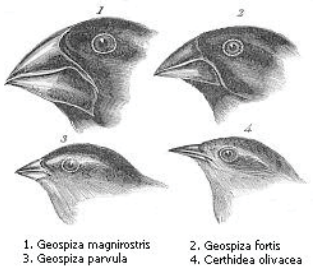
1. What moth characteristics (traits) varied?

2. What characteristics (traits) were selected for?

3. How does the selection process work?

4. What (who) determines which organisms reproduce?

Natural Selection – Case 2



Finches from Galapagos Archipelago

The finch evolution on the Galapagos Islands is another example of natural selection. When Darwin visited the islands in the mid 1800's he found a wide variety of different types of finches. He hypothesized that the different kinds of finches were a result of natural selection and evolution. Although many of the finches shared similar coloring and body size they differed in their beak type (see the picture above).

Darwin hypothesized that some finches from the mainland of South America flew over to the islands, and those that were able to survive in the new environment reproduced and passed their genes to the next generation. Initially the birds varied in the size and shape of their beaks. The birds that were most able to survive were the ones who could live off the food found on the island. For example, islands that had nut trees supported finch populations that had blunt beaks that were strong enough to crack the nuts. Therefore, those finches with the strong, blunt beaks were better able to survive and reproduced, passing their genes to their offspring. Finches in the next generation who had those traits continued to survive and were more likely to reproduce. Finches in that environment who did not have the strong, blunt beaks did not survive as well as the others and therefore were less likely to reproduce and pass their genes to offspring in the next generation.

Other islands had different environments in which finches with different beak types were better able to survive. For example, one island did not have nut trees but instead had lots of berries, and finches with beaks that were better fit for picking berries survived and reproduced, passing their genes to the next generation. On each island the finches that were able to survive and reproduce were the ones that passed their genes on to the next generation. Eventually after many generations of natural selection most individuals in the population had a beak type that helped them survive in that particular environment.

How did the finches on different Galapagos Islands come to have different types of beaks?

_____

_____

_____

_____

Case comparison handout 2

1. What finch characteristics (traits) varied?

2. What characteristics (traits) were selected for?

3. How does the selection process work?

4. What (who) determines which organisms reproduce?

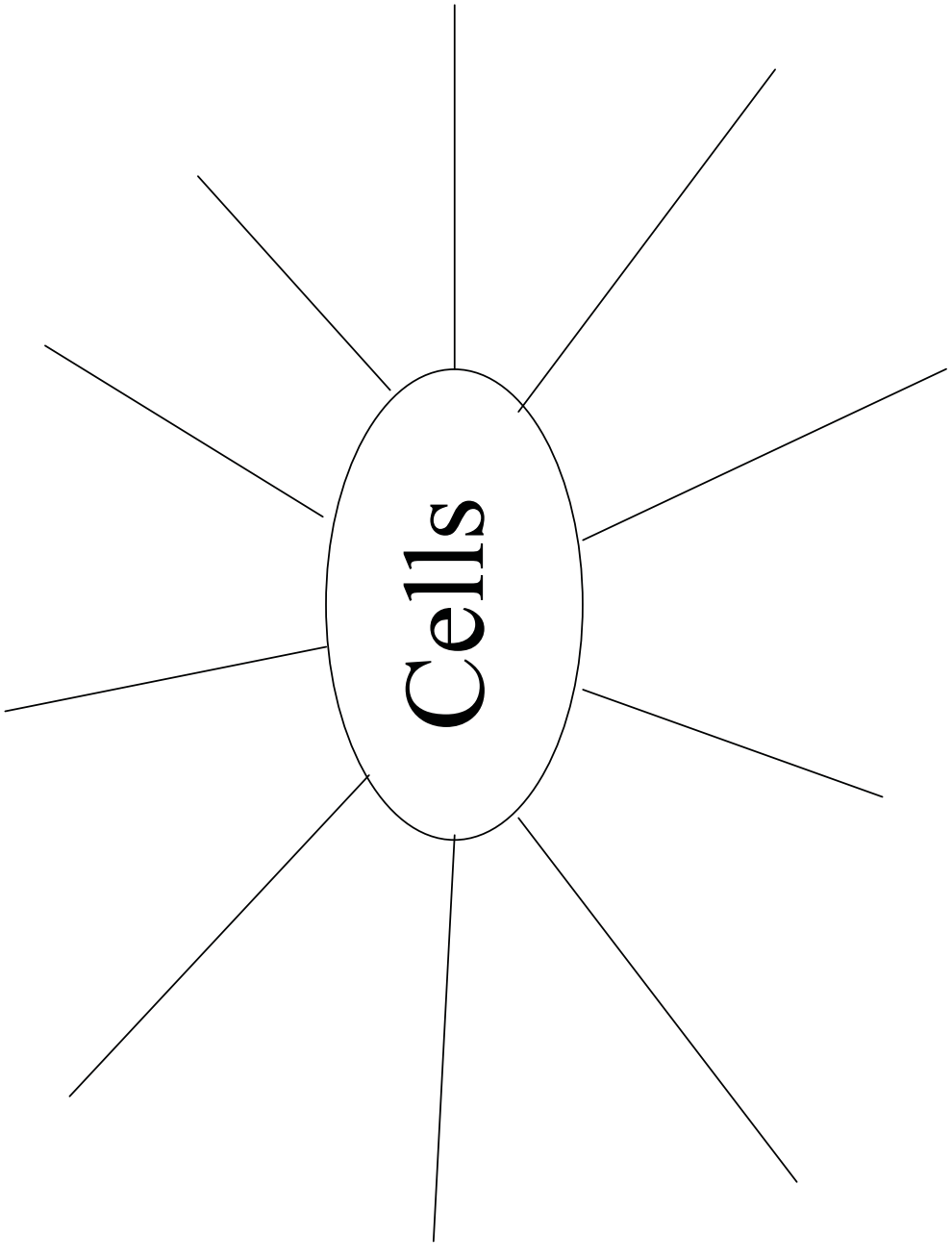
Across the cases:

Question	Moths	Finches
What characteristics affected the survival of the organisms?		
Why were those characteristics important? (selected for)		
How does the selection process work?		
What (who) determines which organisms reproduce?		

Comparing Selective Breeding to Natural Selection

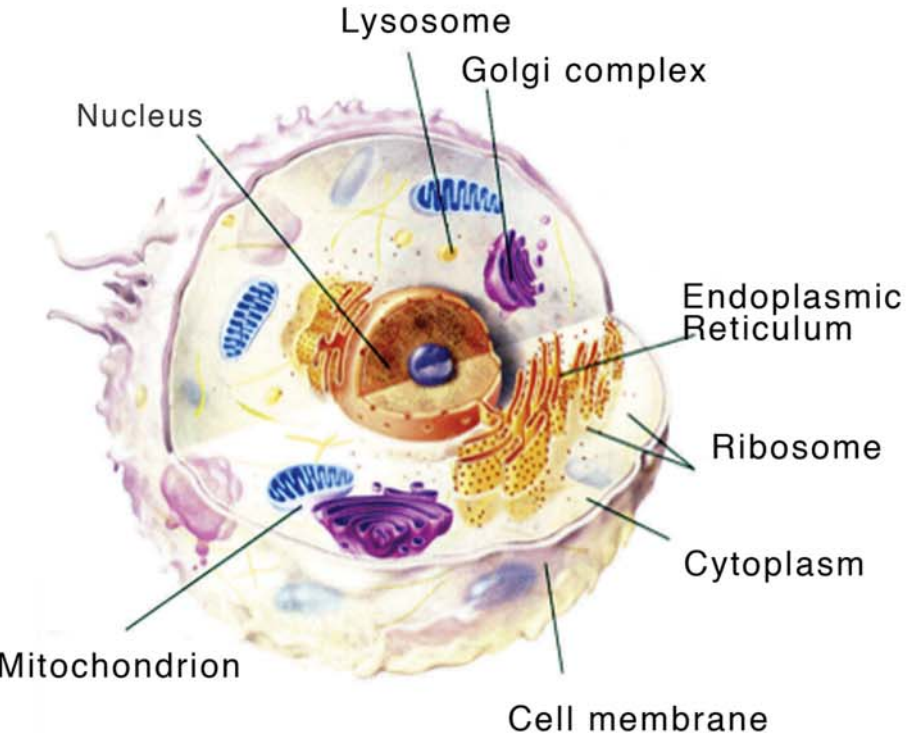
What is similar?

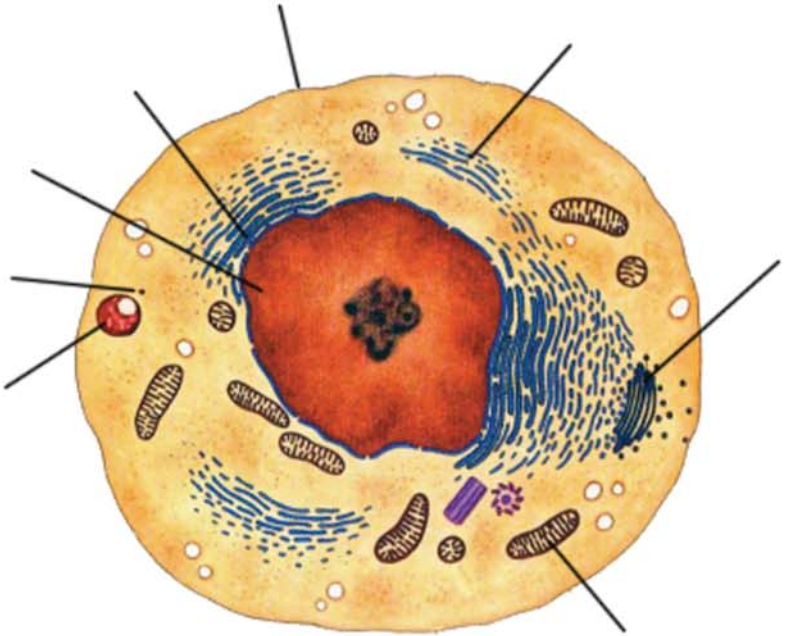
What is different?


Cells

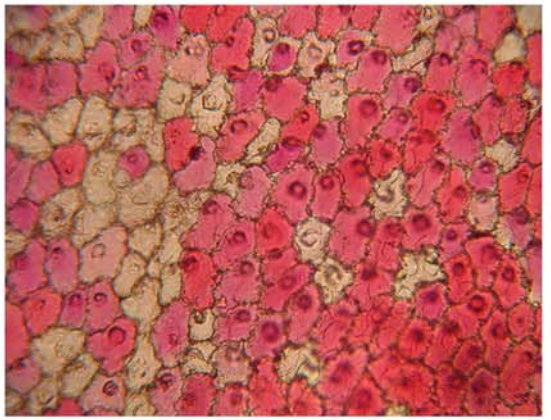
Animal Cells

The picture to the left is of a human neuron (brain cell). Below it, on the bottom left, is a drawing of an animal cell with its organelles labeled. Can you find and label the corresponding organelles on the animal cell on the right side below?

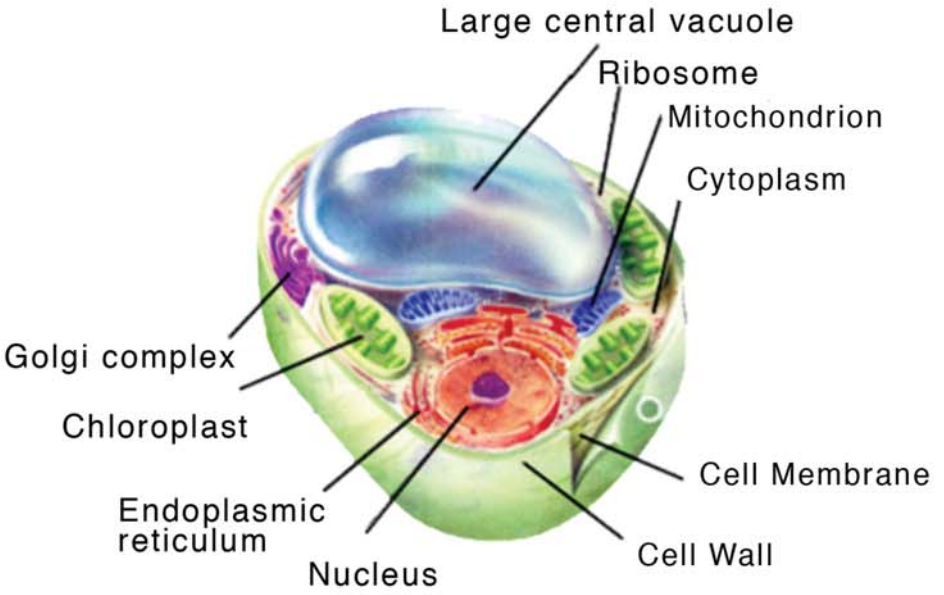


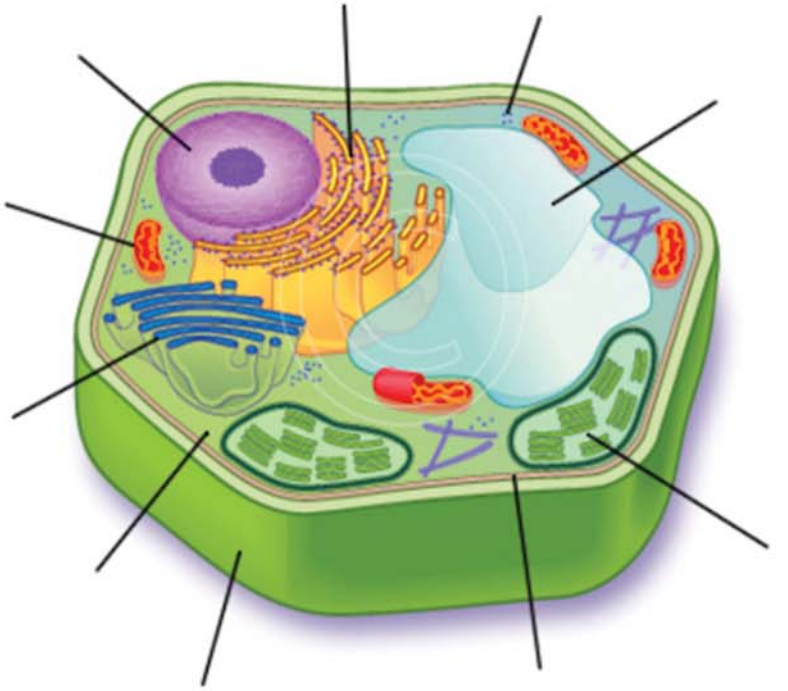


Plant Cells



To the left are pictures of cells from rose petals, taken from under a microscope. Real cells are much smaller, and cannot be seen with the naked eye. Underneath the rose cells is a drawing of a plant cell with its organelles labeled. Can you find and label the corresponding organelles on the plant cell on the right below?





With your partner, please fill in the appropriate organelles in each column, and draw an asterisk (*) next to the ones that are same across both plant and animal cells.

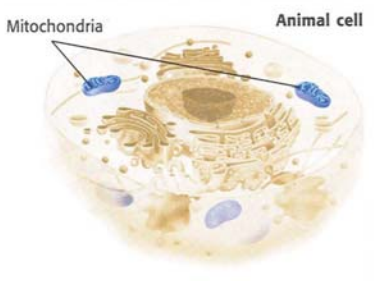
Plant cell	Animal Cell

Cellular Respiration – Case 1

The following data comes from a biology research laboratory investigating cells from the Siberian Tiger. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose	Nothing New
3	Light + Glucose	Nothing New
4	Glucose + Oxygen	Carbon Dioxide + Water + Energy

These cell activities took place in the Mitochondrion.



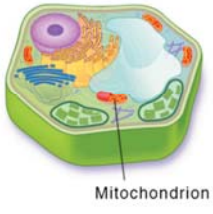
What variables are necessary for output? Why?

Cellular Respiration – Case 2

The following data comes from a biology research laboratory investigating cells from rye grass. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose + Water	Nothing New
3	Glucose	Nothing New
4	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy

These cell activities took place in the Mitochondrion.



What variables are necessary for output? Why?

Across the cases

What does cellular respiration look like?

What is the input?

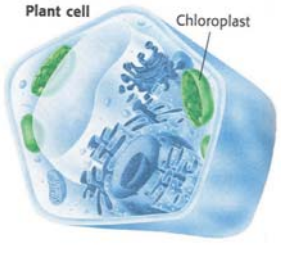
What is the output?

Photosynthesis – Case 1

The following data comes from a biology research laboratory investigating cells from the Ginkgo Tree. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Water	Nothing New
2	Glucose	Nothing New
3	Carbon Dioxide + Water	Nothing New
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.



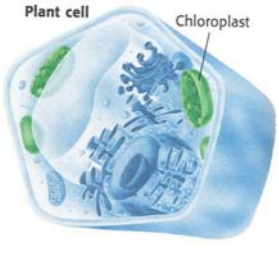
What variables are necessary for output? Why?

Photosynthesis – Case 2

The following data comes from a biology research laboratory investigating cells from the Sage Flower. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Carbon Dioxide	Nothing New
2	Water + Energy (Sunlight)	Nothing New
3	Dirt + Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.



What variables are necessary for output? Why?

Across the cases

What does photosynthesis look like?

What is the input?

What is the output?

Respiration vs. Photosynthesis

Process	Input	Output
Cellular Respiration		
Photosynthesis		

Where does cellular respiration occur?

Where does photosynthesis occur?

What is the same between cellular respiration and photosynthesis?

What is different between cellular respiration and photosynthesis?

Review Questions

Compare	Respiration	Photosynthesis
Which living things use this process?		
Where does the process take place in the cell?		
Is glucose (food) made or broken down?		
Is Carbon Dioxide a product or raw material?		
Is Oxygen a product or a raw material?		
Is light needed for the process to occur?		
What does the process produce?		

Name _____ Team # _____

If each set of parent Labrador retrievers has 16 puppies, how many will have black coats? How many will have yellow coats? Fill in your predictions, and then the actual numbers.

		Predicted # (out of 16)		Actual # (out of 16)	
Family	**Parents**	Black	Yellow	Black	Yellow
A	Black-Yellow				
B	Black-Black				
C	Black-Black				
D	Yellow-Yellow				
E	Yellow-Black				

What do you think "dominant" means? _____

_____

What do you think "recessive" means? _____

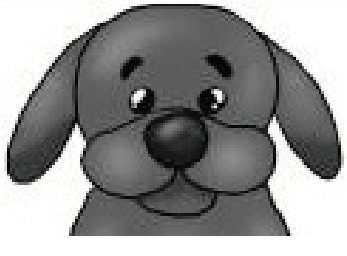
_____

Which color coat is dominant? _____

How do you know?_____

Which color coat is recessive? _____

How do you know? _____



If each set of pea blossom flowers are crossed to product 16 offspring flowers, how many will be purple? How many will be white? Fill in your predictions, and then the actual numbers.

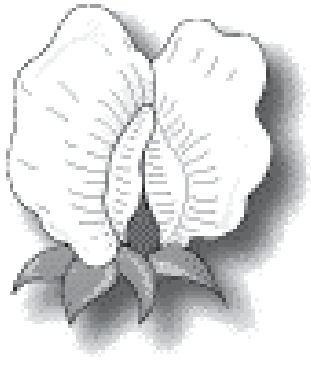
		Predicted # (out of 16)		Actual # (out of 16)	
Cross	**Parent Generation**	Purple	White	Purple	White
A	Purple-White				
B	Purple-Purple				
C	Purple-Purple				
D	White-White				
E	White-Purple				

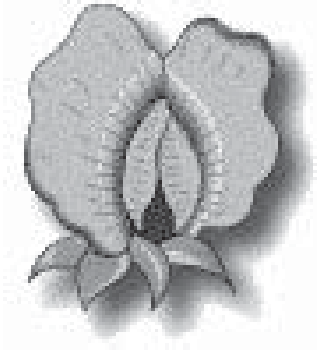
Which flower color is dominant? _____

How do you know? _____

Which flower color is recessive?

How do you know? _____





Student Worksheet

Thinking about Genotypes & Phenotypes

Parents' Phenotypes	Puppy's Genotype	Puppy's Phenotype	Which alleles could this puppy pass on to its off spring?
	Black from Father/Black from Mother (homozygous)	 Max	
	Yellow from Father/Yellow from Mother (homozygous)	 Cody	
	Black from Father/Yellow from Mother (heterozygous)	 Nikki	
	Yellow from Father/Black from Mother (heterozygous)	 Daisy	
	Yellow from Father/Yellow from Mother (homozygous)	 Lady	

Part 1: Fill in the right-hand column in the chart above.

Part 2: Use the chart above to think about the following questions.

1. Give an example of how two puppies could have the same phenotype but different genotypes.

2. Can a puppy with a yellow phenotype have a black allele as part of its genotype? Why or why not?

3. Can a puppy with a black phenotype have a yellow allele as part of its genotype? Why or why not?

4. Use what you know about genotypes and phenotypes to explain how two parents who both have black coats could have a puppy with a yellow coat.

5. How come two black parents could have a puppy with a yellow phenotype but two yellow parents could not have a puppy with a black phenotype?