LESSON 2

Classifying Life

UNLOCK THE BIG Q

- Why Do Biologists Classify Organisms?
- What Are the Levels of Classification?
- How Are Taxonomic Keys Useful?

MY PLANET DIARY

Birds of a Feather

When people first began to travel in airplanes, birds often caused crashes. In 1960, 62 people were killed when birds flew into an airplane's engine. Something had to be done, but no one knew what kinds of birds were causing the crashes. Usually only a tiny, burnt piece of feather remained. Engineers didn't know how big or heavy the birds were, so they couldn't design planes to keep birds out of the engines. Then a scientist named Roxie Laybourne invented a way to classify birds using a tiny piece of feather. She identified the birds from many crashes. Her work helped engineers design engines to reduce bird collisions. She also helped develop bird management programs for major airports. Roxie's work has saved passengers' lives!

CAREER

Answer the questions below.

1. What did Roxie Laybourne invent?

2. Why was her invention so important?

PLANET DIARY Go to **Planet Diary** to learn more about classification.

Lab zone Do the Inquiry Warm-Up *Can You Organize a Junk Drawer?*

Vocabulary

- classification
- taxonomy
- binomial nomenclature
- genus
- species

Skills

- Reading: Ask Questions
- Inquiry: Observe

Why Do Biologists Classify Organisms?

So far, scientists have identified more than one million kinds of organisms on Earth. That's a large number, and it keeps growing as scientists discover new organisms. Imagine how difficult it would be to find information about one particular organism if you had no idea even where to begin. It would be a lot easier if similar organisms were placed into groups.

Organizing living things into groups is exactly what biologists have done. Biologists group organisms based on similarities, just as grocers group milk with dairy products and tomatoes with other produce. Classification is the process of grouping things based on their similarities, as shown in **Figure 1.**

Biologists use classification to organize living things into groups so that the organisms are easier to study. The scientific study of how organisms are classified is called taxonomy (tak SAHN uh mee). Taxonomy is useful because once an organism is classified, a scientist knows a lot of information about that organism. For example, if you know that a crow is classified as a bird, then you know that a crow has wings, feathers, and a beak.

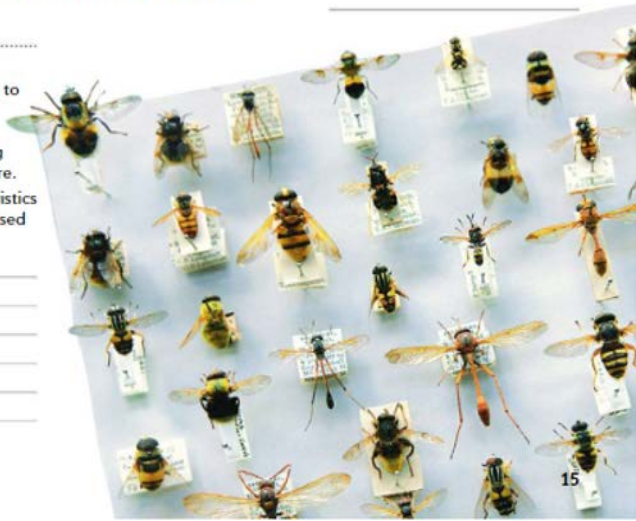
Ask Questions Before you read, preview the headings. Ask a *what*, *why*, or *how* question that you would like answered. As you read, write the answer to your question.

FIGURE 1

Classifying Insects

These bees and wasps belong to a large insect collection in a natural history museum. They have been classified according to the characteristics they share.

Observe What characteristics do you think may have been used to group these insects?



Puma concolor (puma)
Concolor means "the same color" in Latin. Notice that this animal's coat is mostly the same color.

FIGURE 2

Binomial Nomenclature

These three different species of cats were once classified in the same genus based on their structures and behavior. But other types of evidence led scientists to classify the puma in the genus, *Puma*.

Infer **Suppose someone told you that a jungle cat is classified in the same genus as house cats. What characteristics and behaviors do you think a jungle cat might have?**

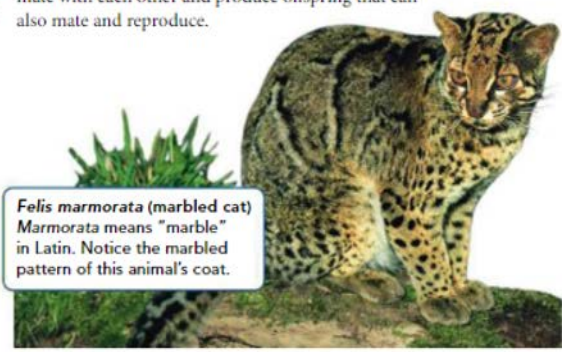
The Naming System of Linnaeus

Taxonomy also involves naming organisms. In the 1730s, the Swedish botanist Carolus Linnaeus devised a system of naming organisms that is still used today. Linnaeus placed organisms in groups based on their observable features. Each organism was given a unique, two-part scientific name. This system is called **binomial nomenclature** (by NOH mee ul NOH men klay chur). *Binomial* means "two names."

Genus and Species The first word in an organism's scientific name is its genus. A **genus** (JEE nus; plural *genera*) is a classification grouping that contains similar, closely related organisms. As shown in **Figure 2,** below, house cats and marbled cats are classified in the genus *Felis*. Organisms that are classified in the genus *Felis* share characteristics such as sharp, retractable claws and behaviors such as hunting other animals.

The second word in a scientific name often describes a distinctive feature of an organism, such as where it lives or its appearance. Together, the two words form the scientific name of a unique kind of organism. A **species** (SPEE sheez) is a group of similar organisms that can mate with each other and produce offspring that can also mate and reproduce.

Felis domesticus (house cat)
Domesticus means "of the house" in Latin.



Felis marmorata (marbled cat)
Marmorata means "marble" in Latin. Notice the marbled pattern of this animal's coat.

Using Binomial Nomenclature A complete scientific name is written in italics. Only the first letter of the first word in a scientific name is capitalized. Notice that scientific names contain Latin words. Linnaeus used Latin words in his naming system because Latin was the language that scientists used during that time.

Binomial nomenclature makes it easy for scientists to communicate about an organism because everyone uses the same scientific name for the same organism. Using different names or common names for the same organism can get very confusing, as **Figure 3** describes.

FIGURE 3

What Are You Talking About?

Is this animal a groundhog, a woodchuck, a marmot, or a whistlepig? Depending on where you live, all of these names are correct. Luckily, this animal has only one scientific name, *Marmota monax*.

Describe How is a scientific name written?

_____

_____

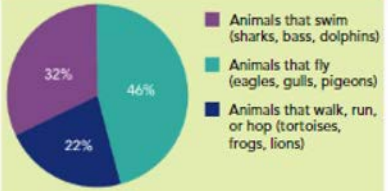
_____

do the math!

Aristotle and Classification

Aristotle, an ancient Greek scholar, also developed a classification system for animals.

Animals With Blood



1. **Read Graphs** Which group made up the largest percentage of animals?

_____

2. **Calculate** _____ percent of these animals either fly or swim.

3. **Classify** What new categories would you use to make a graph that classifies animals that move in more than one way?

_____

_____

_____

Lab zone Do the Quick Lab *Classifying Seeds.*

Assess Your Understanding

1a. **Define** The scientific study of how living things are classified is called

_____

b. **Make Generalizations** What is the advantage of using scientific names instead of using common names, like cat or dog?

_____

_____

_____

_____

_____

_____

got it?

- ○ I get it! Now I know that organisms are classified _____

_____

_____

- ○ I need extra help with _____

_____

Go to my science coach *online for help with this subject.*

What Are the Levels of Classification?

The classification system that scientists use today is based on the contributions of Linnaeus. But today's classification system uses a series of many levels to classify organisms.

To help you understand the levels of classification, imagine a room filled with everybody who lives in your state. First, all of the people who live in your town raise their hands. Then those who live in your neighborhood raise their hands. Then those who live on your street raise their hands. Finally, those who live in your house raise their hands. Each time, fewer people raise their hands. The more levels you share with others, the more you have in common with them.

The Major Levels of Classification

Of course, organisms are not grouped by where they live, but by their shared characteristics. Most biologists today classify organisms into the levels shown in **Figure 4.** First, an organism is placed in a broad group, which in turn is divided into more specific groups.

A domain is the broadest level of organization. Within a domain, there are kingdoms. Within kingdoms, there are phyla (FY luh; singular *phylum*). Within phyla are classes. Within classes are orders. Within orders are families. Each family contains one or more genera. Finally, each genus contains one or more species. The more classification levels two organisms share, the more characteristics they have in common and the more closely related they are.

FIGURE 4

VIRTUAL LAB **Levels of Classification**

The figure on the facing page shows how the levels of organization apply to a great horned owl.

Answer the questions.

1. **Observe** List the characteristics that the organisms share at the kingdom level.

2. **Observe** List the characteristics that the organisms share at the class level.

3. **Observe** List the characteristics that the organisms share at the genus level.

4. **Draw Conclusions** How does the number of shared characteristics on your list change at each level?

5. **Interpret Diagrams** Robins have more in common with (lions/owls).

Levels of Classification

As you move down these levels of classification, the number of organisms decreases. The organisms that remain share more characteristics with one another and are more related.

Lab zone Do the Quick Lab *Make a Classification Chart.*

Assess Your Understanding

got it?

- O I get it! Now I know that the levels of classification are _____
- O I need extra help with _____

Go to my science coach online for help with this subject.

How Are Taxonomic Keys Useful?

Why should you care about taxonomy? Suppose that you are watching television and feel something tickling your foot. Startled, you look down and see a tiny creature crawling across your toes. Although it's only the size of a small melon seed, you don't like the looks of its two claws waving at you. Then, in a flash, it's gone.

How could you find out what the creature was? You could use a field guide. Field guides are books with illustrations that highlight differences between similar-looking organisms. You could also use a taxonomic key. **Taxonomic keys are useful tools that help determine the identity of organisms.** A taxonomic key consists of a series of paired statements that describe the various physical characteristics of different organisms. The taxonomic key shown in **Figure 5** can help you identify the mysterious organism.

FIGURE 5

INTERACTIVE ART **Identifying Organisms**

The six paired statements in this taxonomic key describe physical characteristics of different organisms.

Identify _____ different organisms can be identified using this key. The mysterious organism is a _____

0.4 mm

Taxonomic Key

Step		Characteristics	Organism
1	1a.	Has 8 legs	Go to Step 2.
	1b.	Has more than 8 legs	Go to Step 3.
2	2a.	Has one oval-shaped body region	Go to Step 4.
	2b.	Has two body regions	Go to Step 5.
3	3a.	Has one pair of legs on each body segment	Centipede
	3b.	Has two pairs of legs on each body segment	Millipede
4	4a.	Is less than 1 millimeter long	Mite
	4b.	Is more than 1 millimeter long	Tick
5	5a.	Has clawlike pincers	Go to Step 6.
	5b.	Has no clawlike pincers	Spider
6	6a.	Has a long tail with a stinger	Scorpion
	6b.	Has no tail or stinger	Pseudoscorpion

Start Here

First: For each set of statements, choose the one that best describes the organism; for example, 1a.

Second: Follow the direction to the next step.

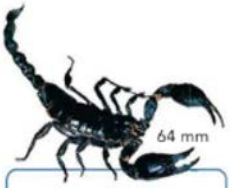
Third: Continue process until organism is identified.

apply it!

Use the taxonomic key in **Figure 5** to answer the following questions.

1 Interpret Tables Identify each pictured organism.

_____



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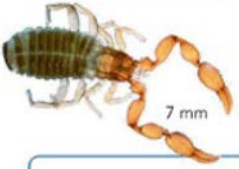

_____

_____

2 Draw Conclusions What other information could have been helpful in identifying these organisms?

_____

_____

_____

3 CHALLENGE Is this information necessary for the key in **Figure 5**? Explain your answer.

_____

_____

_____

Lab zone® Do the Quick Lab *Living Mysteries.*

Assess Your Understanding

got it?

- ○ I get it! Now I know that taxonomic keys are used to _____
- ○ I need extra help with _____

Go to my science coach *online for help with this subject.*