

## Vocabulary

- model
- system
- input
- process
- output
- feedback

## Skills

- 👁️ Reading: Sequence
- 🔺 Inquiry: Classify

# Why Do Scientists Use Models?

So what exactly is a model? A model is a representation of a simple or complex object or process. Models can be pictures, diagrams, three-dimensional objects, mathematical equations, chemical equations, computer programs, or even written descriptions.

**📺 Scientists use models to understand things that they cannot observe directly.** Models help scientists to understand things that are very large, such as the universe, or things that are very small, such as an atom. Models can also help scientists to understand processes, such as weather systems. **Figure 1** shows how models can be used to predict earthquake damage.

FIGURE 1 .....

### Shake, Rattle, and Roll

Look at how these two models of houses, built with different materials, react to an "earthquake" simulated by a shaking table.

**📝 Apply Concepts** How might scientists use the information from how the models reacted to the "earthquake"?

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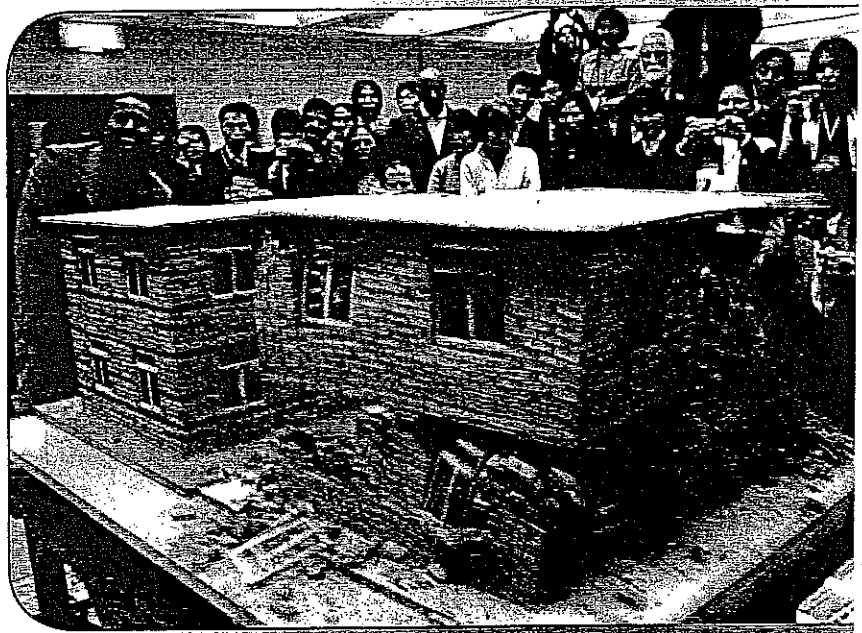
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Do the Lab Investigation  
*Super Models.*


## 📺 Assess Your Understanding

got it? .....


I get it! Now I know scientists use models because \_\_\_\_\_

I need extra help with \_\_\_\_\_


# What Is a System?

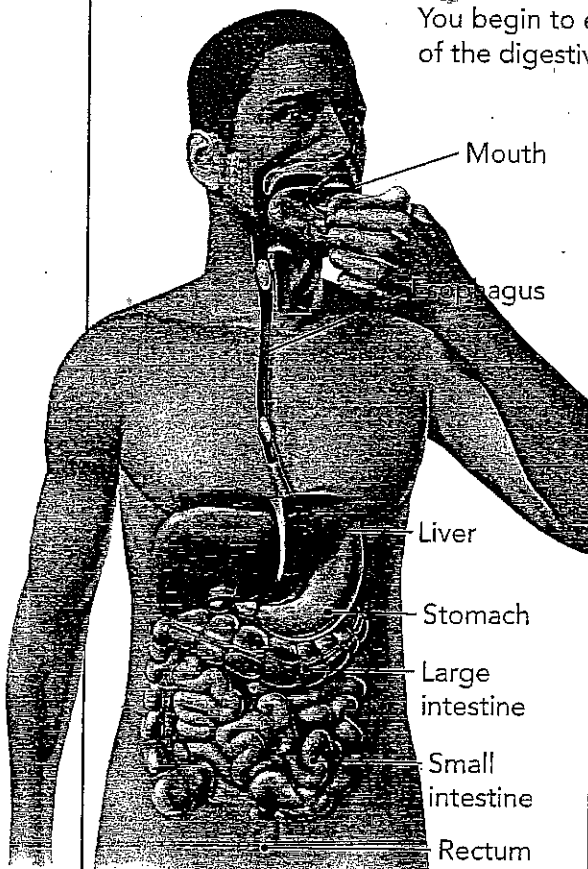
What happens when you touch a hot stove? Your nervous system sends a signal to your muscles to pull your hand away from the hot surface. Your response to the hot stove is an example of a system in action.  A system is a group of parts that work together to perform a function or produce a result.

Every system has an input, process, and output. **Input** is the material or energy that goes into the system. **Process** is what happens in the system. **Output** is the material or energy that comes out of the system. When you touch a hot stove, your skin sends a message to your nervous system. This is the input. Your nervous system understands that you are touching something hot. This is the process. The output is when your nervous system sends a signal to your muscles to pull your hand back. **Feedback** is output that changes the system in some way. For example, when you pull your hand back from the hot stove, your nervous system sends a message that your hand is no longer touching a hot object, so you can relax.

 **Sequence**  
Underline and number the steps that happen in your nervous system when you touch a hot stove.

## apply it!

 **Classify** You and your friends are sitting at the lunch table enjoying your food. You begin to eat an apple. In the chart below, fill in the input, process, and output of the digestive system. Circle and label the input and process on the diagram.




Input	<hr/> <hr/> <hr/>
Process	<hr/> <hr/> <hr/>
Output	<hr/> <hr/> <hr/>
Feedback	<hr/> <hr/> <hr/>

**Mechanical Systems** People have designed many mechanical systems to keep them comfortable or to help them do work. Heating and air conditioning systems, elevators, and engines are examples of mechanical systems. **Figure 2** shows an example of a basic mechanical system.


FIGURE 2 .....

**A System on Wheels**

This skateboarder may be having too much fun to realize it, but his skateboard is a mechanical system.

 **Apply Concepts** Describe the input, process, and output of this system in the spaces provided. Then, in the empty space, draw an example of a mechanical system you use.

Input	<hr/> <hr/> <hr/>
Process	<hr/> <hr/> <hr/>
Output	<hr/> <hr/> <hr/>

 **Vocabulary Prefixes** The prefix *in-* can mean "into" or "within," such as in the word *input*. It can also mean "not." What do you think the word *inability* means?

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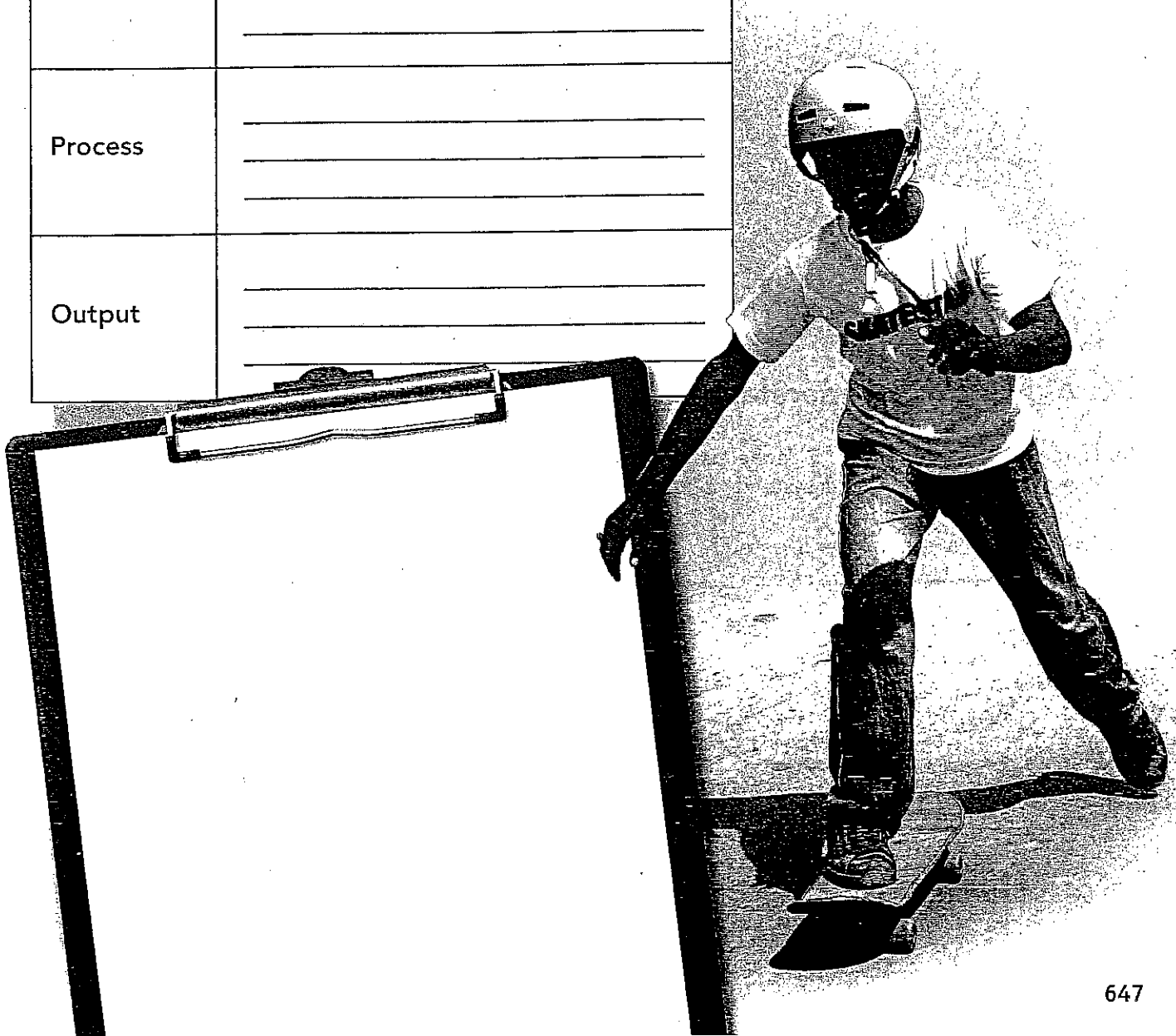



FIGURE 3 .....

### Cloud Formation

Clouds form when warm, moist air rises and cools. Water vapor condenses onto tiny particles in the air.

 On the lines provided, write the input, process, and output of this system.

1. **Identify** What is the input of this system?

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2. **Predict** What would happen if there was no input?

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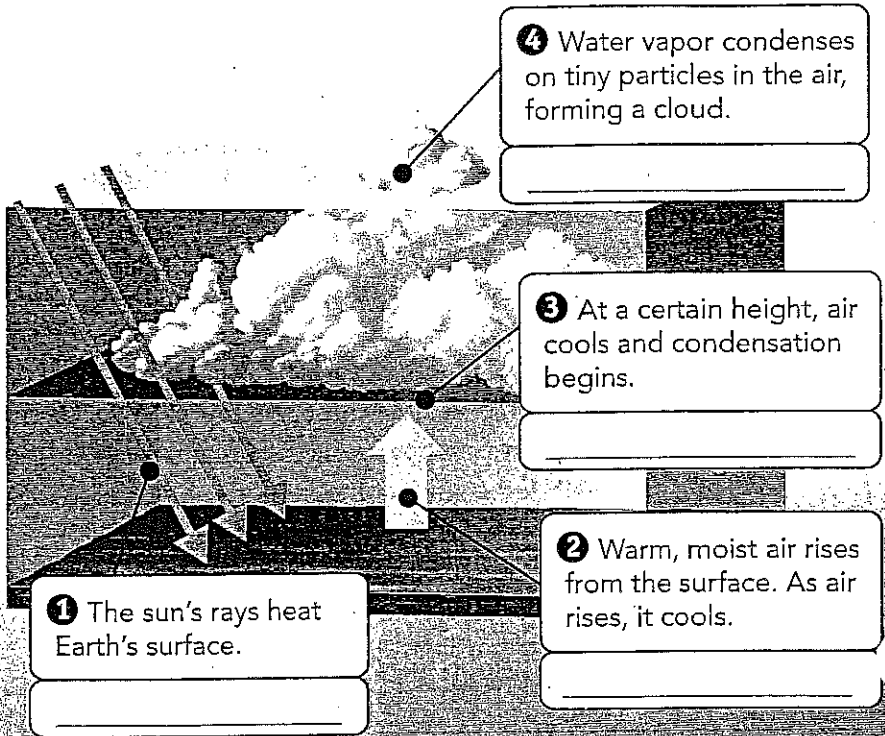
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**Environmental Systems** There are many systems in nature. Environmental systems may involve biological, geological, and physical parts. The process that forms soil is one environmental system. Another is how a cloud forms, shown in **Figure 3**.



**Lab zone** Do the Quick Lab Systems of Science.

### Assess Your Understanding

1a. Name \_\_\_\_\_ is the material or energy that comes out of a system.

b. Explain Why is a computer a system?

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c. **CHALLENGE** What are the input, process, and output of an automatic paper towel dispenser?

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**got it?** .....

I get it! Now I know that a system is \_\_\_\_\_

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I need extra help with \_\_\_\_\_

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# How Are Models of Systems Used?

Many systems are complex. Scientists cannot always observe all the inputs, processes, and outputs of a complex system.


 Scientists often use models of systems to understand how systems work. These models can help scientists to predict changes in a system as a result of a change in input or system feedback.

**Using Basic Models** Sometimes basic models of complex systems allow scientists, students, or the public to get a general knowledge of the system. These models do not show all the details of the system. However, they still show the major parts, processes, and relationships in the system. Figure 4 shows a model of a basic system, the tick life cycle.

FIGURE 4 .....

## Life Cycle of the American Dog Tick

American dog ticks are a common pest. They can spread diseases such as Rocky Mountain spotted fever to humans.

 **Interpret Diagrams** Read the model of the life cycle of the American dog tick below. Then, fill in the sign with a title and information that could help you avoid ticks.

