

2

Creature Features

MODELING

IN THE LAST activity, you learned that Marfan syndrome is caused by a gene. A **gene** carries information that is passed from parents to offspring. This means that if Joe does have Marfan syndrome, he can pass the gene on to any children he may have.

The transmission of genes is called **heredity**, and a gene that is passed from a parent to an offspring is **inherited**. Cells need the information transmitted by genes to grow and perform their functions. How are genes for a trait passed from parents to offspring? How do they determine the offspring's traits?

Scientists have learned a lot about how genes cause traits by breeding plants and animals that grow rapidly and breed at an early age. In this activity, you will use an imaginary creature to develop a model that explains your ideas about genes and heredity. A **model** is a representation of a system that scientists use to help one understand and communicate how the system works. Then you will engage in scientific argument as you compare your explanation to explanations developed by other students. Later in this unit, you will have a chance to expand or revise your explanation.

This model and other models in this unit will help you figure out the chances that Joe will transmit Marfan syndrome to children he may have.



Like all offspring, these puppies have inherited their genes from their parents.

GUIDING QUESTION

How are simple inherited traits passed from parents to their offspring and then to the next generation?

MATERIALS

For each group of four students

- 20 orange plastic disks
- 30 blue plastic disks
- 1 copy of the Critter Template on chart paper
- orange, blue, and black colored pencils or markers

For each student

- 1 Student Sheet 2.1, “Modeling Genes”

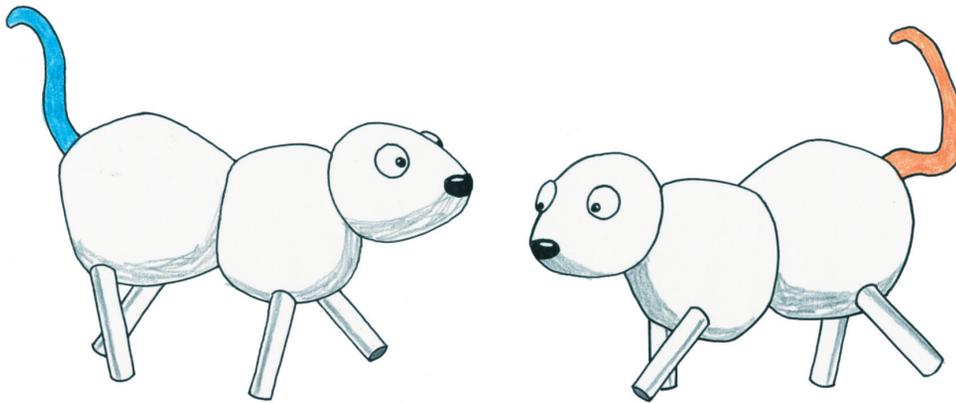
PROCEDURE

1. Scientists suggest possible explanations based on observations. They call one of these possible explanations a **hypothesis** (plural **hypotheses**). As you read the story about breeding endangered critters, try to come up with possible explanations, or hypotheses, for what happens.
 - a. Read the story of two endangered critters.
 - b. At the end of each passage, discuss the Stop to Think questions with your group. They will help you to come up with hypotheses to explain what is happening.
2. To evaluate your hypotheses, use Student Sheet 2.1, “Modeling Genes,” to model the behavior of genes passed from parents to offspring. When you do this, make three assumptions:
 - Blue and orange plastic disks represent the genes for the blue and orange tail colors.
 - Offspring get copies of genes from their parents.
 - Each critter has the same number of genes.

ENDANGERED CREATURES

Part A: The First Generation

Imagine two islands in the ocean, far from land. The only known population of blue-tailed critters lives on one island. The only known population of orange-tailed critters lives on the other island. The critter population is shrinking, and critters have just been classified as an endangered species. Although they produce many offspring, very few of the critter offspring survive in the wild because most are eaten by the black-billed yellowbird.



Skye is a rare blue-tailed critter.

Poppy is a rare orange-tailed critter.

Critters are hard to capture, so very few critters exist in captivity. Skye, a blue-tailed critter, lives in the Petropolis zoo. Poppy, an orange-tailed critter, lives in the Lawrenceville zoo. Critters reproduce by sexual reproduction. The research departments in these two world-famous zoos have decided to try breeding Skye and Poppy in order to produce offspring and keep the rare critters from becoming extinct. **Breeding** involves intentionally mating two organisms to see what offspring they produce. This process is also often referred to as **crossing**.

STOP TO THINK 1

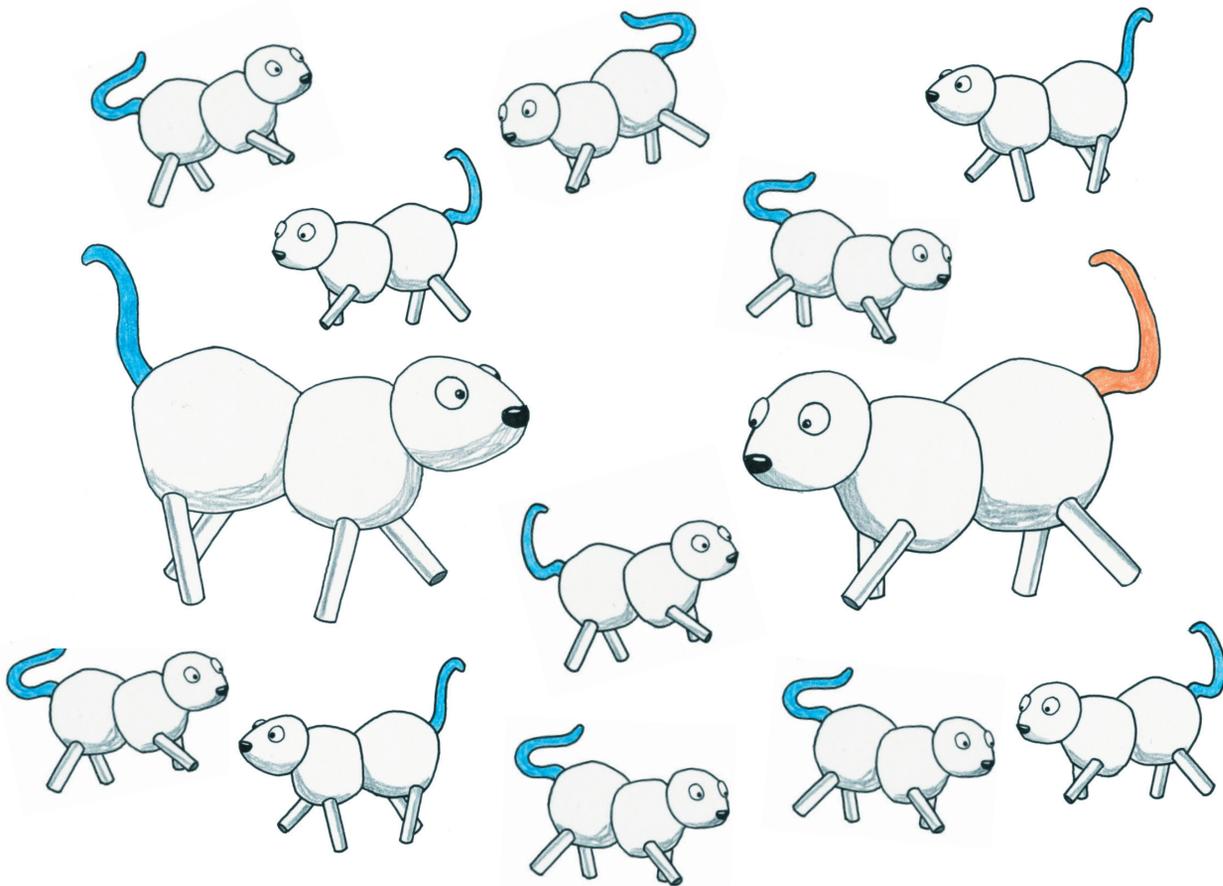
Discuss this question with your group: What do you think the tails of Skye and Poppy's offspring will look like?

Part B: The Second Generation

The breeding program is a great success. Skye and Poppy produce 100 offspring!

However, all 100 of these second-generation critters have blue tails. The scientists are concerned. “Will the orange-tail trait be lost?” they wonder.

The zoo scientists wonder why none of the critter pups have orange tails. They begin to argue about several possible explanations.

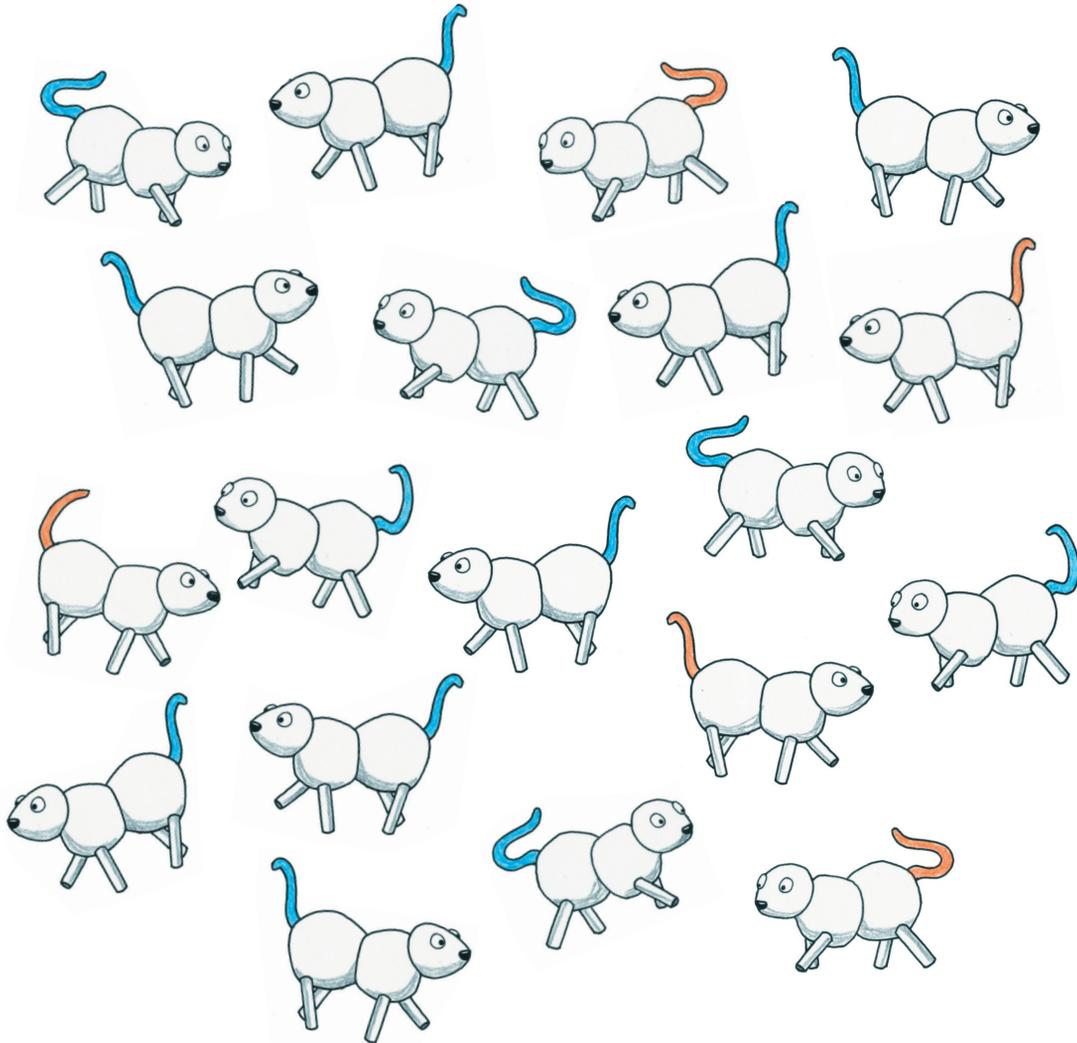


STOP TO THINK 2

Discuss this question with your group: Why do all of the offspring have blue tails? Develop one or more hypotheses. Be prepared to share one of your hypotheses with the class.

Part C: The Third Generation

Further attempts to breed Skye and Poppy are unsuccessful. However, once Skye and Poppy's offspring mature, they begin to have pups of their own. The scientists are fascinated by the results. Some of Skye and Poppy's "grandpups" have orange tails. The scientists notice that about 1/4 of all the pups in this third generation have orange tails. The rest have blue tails.



STOP TO THINK 3

Discuss this question with your group: Does the evidence so far from the second and third generations help you decide which hypothesis or hypotheses might be correct? Explain. **Reminder:** Use Student Sheet 2.1 to evaluate the hypotheses.

ANALYSIS

1. **Evidence** is information that supports or refutes a claim. Based on the breeding results and your models, which hypothesis do you think best fits the evidence? Explain your answer.
2. Draw a diagram of the model you created for the hypothesis that you think best fits the evidence. Be sure to
 - add labels.
 - write a caption to help others understand your diagram.
3. A **pattern** is something that happens in a repeated and predictable way. What pattern do you see with the orange-tail trait as it passes from Skye and Poppy to their children and grandchildren?
4. What do you think might cause the pattern you described in Analysis item 3?