

58 Creature Features



Genes determine inherited traits by carrying the information that is passed from parents to offspring. These genes carry information that each cell of an organism needs in order to grow and perform its activities. How are genes for a trait passed from parents to offspring? How do they determine the offspring's traits?



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 disks

30 blue disks

**1 copy of the Critter-breeding Template
orange and blue colored pencils**



For each student

1 Student Sheet 58.1, "Modeling Genes"

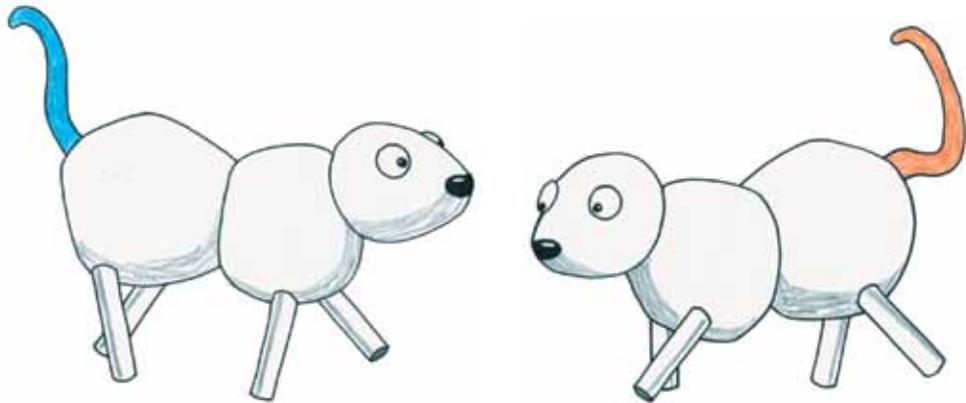
PROCEDURE

1. Scientists suggest explanations based on observations. They call these explanations hypotheses. Read the story of two endangered critters. As you read, think about possible hypotheses for the tail colors.
2. In order to evaluate your hypotheses, use Student Sheet 58.1, “Modeling Genes,” to model the behavior of genes passed from parents to offspring.

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.



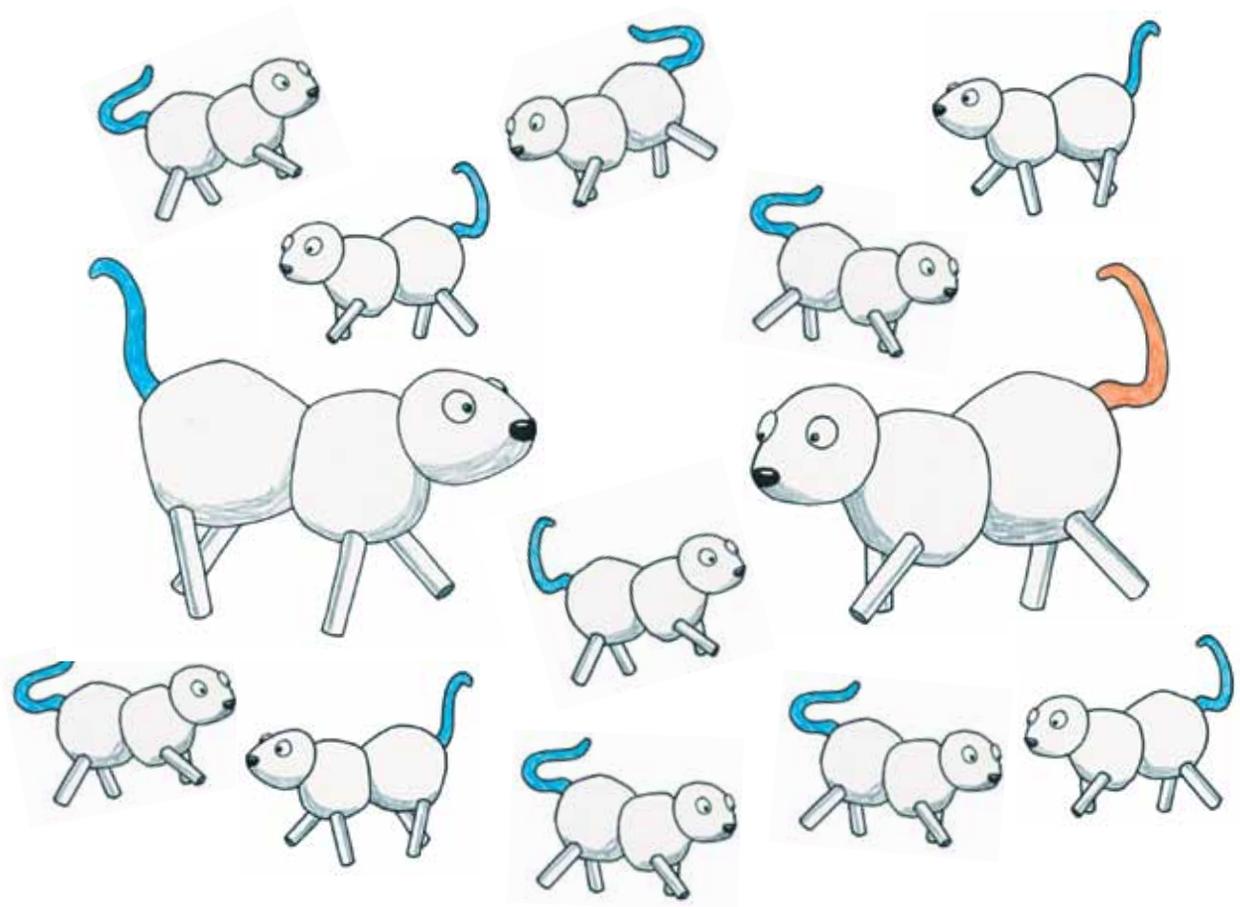
Skye is a rare blue-tailed critter

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.

STOPPING TO THINK 1

What do you think the tails of Skye and Poppy’s offspring will look like? Explain your opinions to your group.



Part B: The Second Generation

The breeding program is a great success. Skye and Poppy produce 100 off-spring!

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

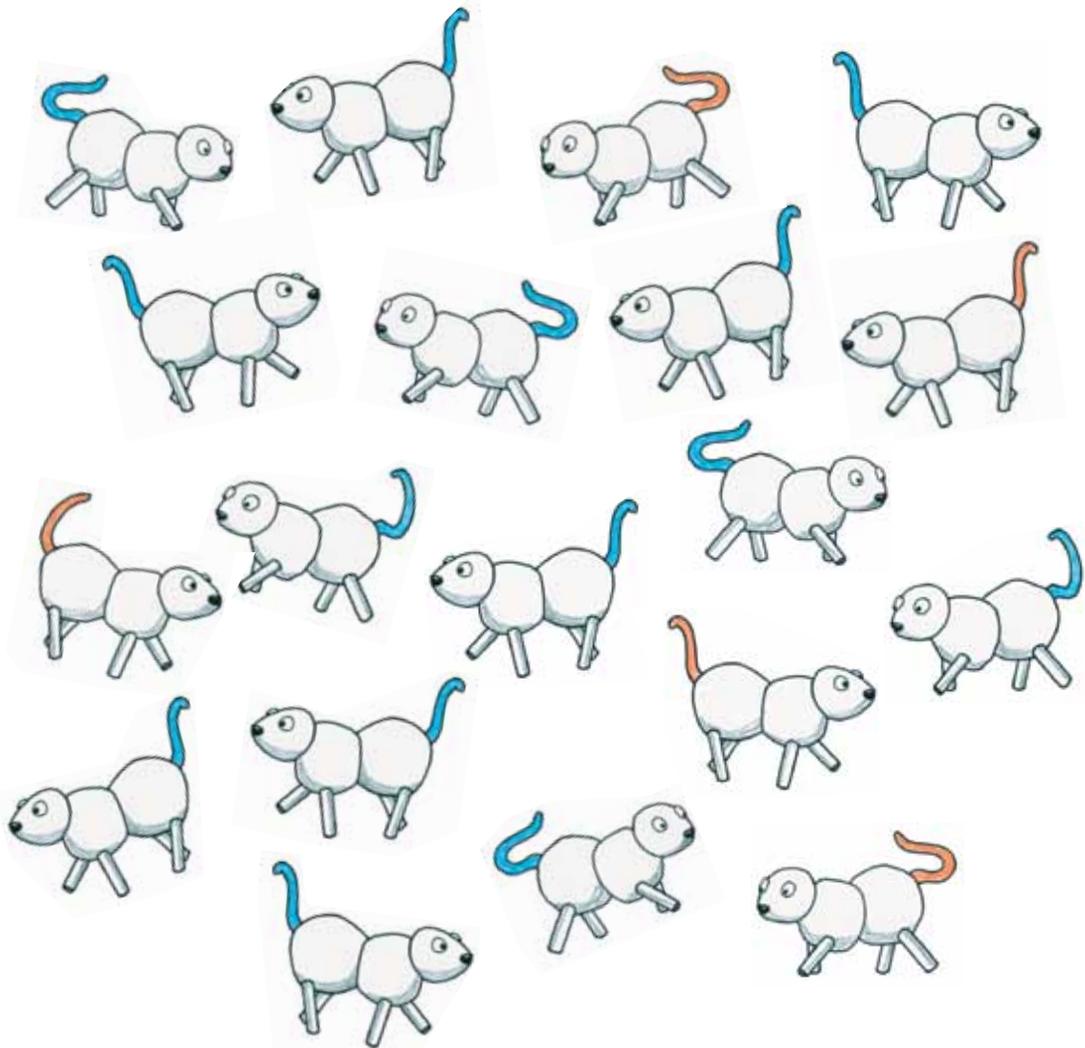
The zoo scientists wonder why none of the critter pups have orange tails. They begin to argue about several possible explanations.

STOPPING 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 “grand-pups” have orange tails. The scientists notice that about one-fourth of all the pups in this third generation have orange tails. The rest have blue tails.



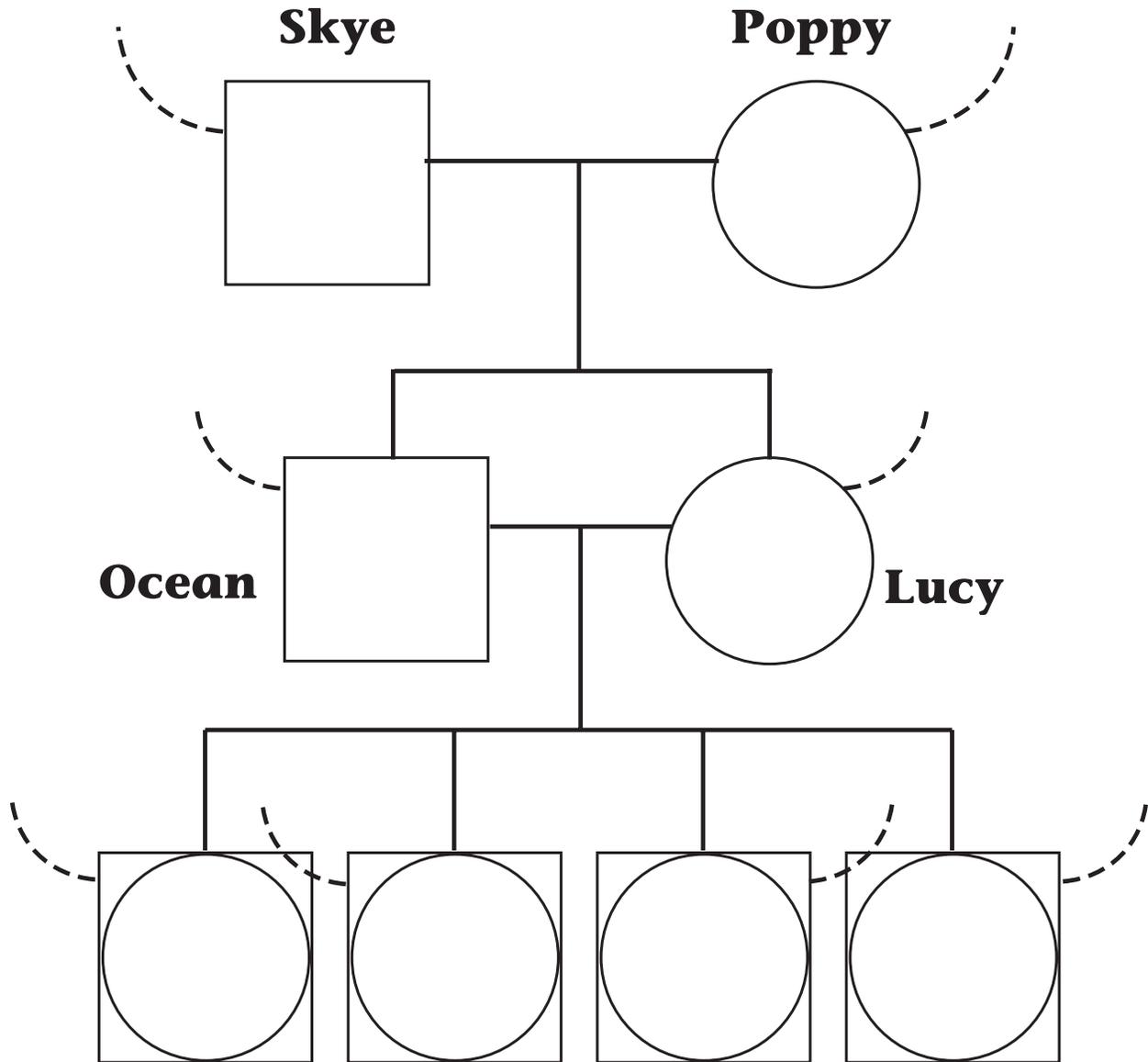
STOPPING TO THINK 3

Discuss 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.

ANALYSIS

1. Based on the breeding results and your simulations, which hypothesis do you think best fits the evidence? Explain your answer.
-  2. Based on the reading, create at least three rules for how genes are passed through generations. Be prepared to share your rules with the class.
3. **Reflection:** You have used models to investigate several scientific questions in *Issues and Life Science*. What are the trade-offs of using models to investigate the real world?

Critters Template



Modeling Genes

Scientists often construct simple models that help them test hypotheses. In this activity, you will use colored disks to represent genes for tail color. You can think of the genes as bits of information that carry directions for the traits of the organism.

CHALLENGE

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

MATERIALS



For each group of four students

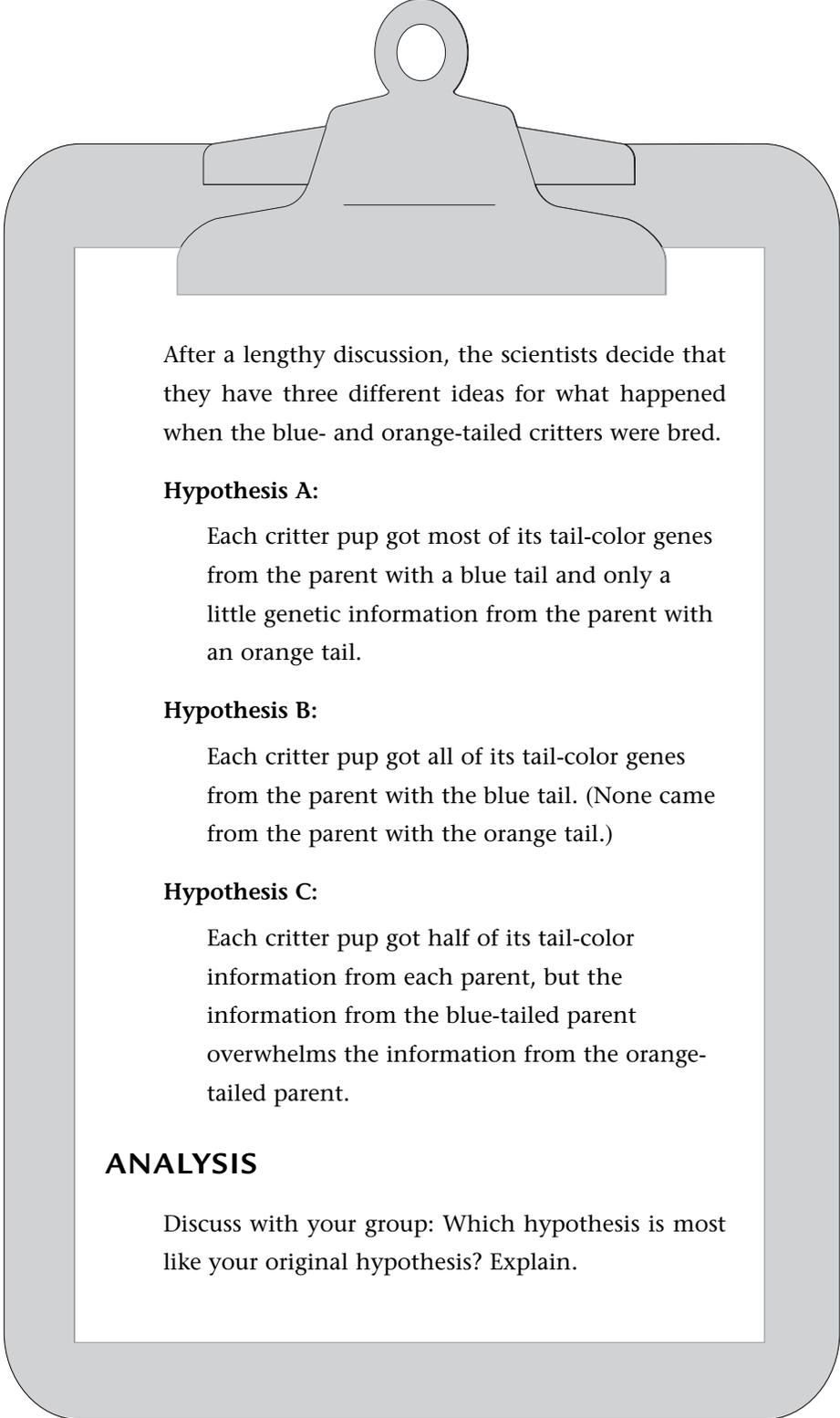
- 1 copy of Transparency 58.4, "Critter Template"
- 20 orange plastic disks
- 30 blue plastic disks

PROCEDURE

1. Decide which hypothesis you will model first.
2. Assume that each critter has the same total number of tail-color genes. To keep your simulation simple, decide with your partner whether to try the simulation with 2, 3, or 4 tail-color genes in each critter.
3. Place the number of orange tail-color genes (orange disks) you have chosen into Poppy's outline on your critter-breeding template.
4. Place the number of blue tail-color genes (blue disks) you have chosen into Skye's outline on your critter-breeding template.
5. Decide how many genes you think each parent (Skye and Poppy) gives to each offspring. Don't take the genes away from Skye and Poppy. Skye and Poppy give copies to their offspring. Take the copies you need from your pile of disks. Place the appropriate number of orange and blue disks in the outline for each offspring. *Remember, each offspring has to have the same total number of tail-color genes as Skye and Poppy.*

6. Review what you did in Steps 4 and 5. Be sure it fits the hypothesis you are modeling.
7. Decide how many blue and orange genes you think each parent in the second generation gives to each of the offspring in the third generation. Try to develop a logical model that will result in approximately 3 blue-tailed creatures for every 1 orange-tailed creature. Place the number of blue and orange disks that each offspring must receive into the outlines for the third-generation offspring.
8. Keep a record of your group's model. Be prepared to explain your ideas to the class.
9. Next try simulating the transfer of genes from Poppy and Skye to their offspring according to each of the other hypotheses developed in class. Follow Steps 1–7.
10. Answer the Analysis Questions on page D-29 in your Student Book.

Alternative Hypotheses



After a lengthy discussion, the scientists decide that they have three different ideas for what happened when the blue- and orange-tailed critters were bred.

Hypothesis A:

Each critter pup got most of its tail-color genes from the parent with a blue tail and only a little genetic information from the parent with an orange tail.

Hypothesis B:

Each critter pup got all of its tail-color genes from the parent with the blue tail. (None came from the parent with the orange tail.)

Hypothesis C:

Each critter pup got half of its tail-color information from each parent, but the information from the blue-tailed parent overwhelms the information from the orange-tailed parent.

ANALYSIS

Discuss with your group: Which hypothesis is most like your original hypothesis? Explain.

