Sensitive Periods Many behaviors develop and become fixed during a particular period of an animal's life. The song of male birds develops during a brief period early in life. The song develops from the bird's hearing its father's song and undergoing hormonal changes as the bird matures. Language in humans develops most rapidly in the first several years of life. The ability to learn new languages diminishes as we age. **Imprinting** occurs when an animal develops a particular response to an object or organism *only* during a brief period early in life. In this way, imprinting differs from other types of learning.

Imprinting Young geese and ducks have no innate recognition of their mother. These birds are genetically programmed to follow the first moving object they see during a short period immediately after they hatch. This behavior is highly adaptive; the young must follow their mother as she leads them to water, helps them find food, and keeps them out of danger. However, the young will follow any object they see during this period, just as they would their mother—including toy wagons, boxes, and balloons. Once the young birds imprint on an object, they prefer to follow it, even when given the opportunity to follow a member of their own species.

Scientist Konrad Lorenz observed imprinting when he raised a group of newly hatched goslings (young geese) by hand and found that they imprinted on *him*. **Figure 7** shows an extension of this experiment—an aircraft leading a "family" of cranes. The cranes' *ability* to imprint on an object is not a learned behavior; the ability is programmed into their genes. However, the *process* of imprinting is a form of learned behavior. Learning determines the final shape of this genetically based behavior.

› **Reading Check** *What are the benefits of imprinting behavior?*



Figure 7 These cranes imprinted on a researcher riding in this ultralight aircraft and followed it around as if the researcher were their mother.

ACADEMIC VOCABULARY

adaptive able to adjust to changes

Section 1 Review

KEY IDEAS

1. **List** the two questions that help scientists study behavior.
2. **Describe** influences on behavior.
3. **Explain** how evolution shapes behavior.
4. **State** what influences innate behavior.
5. **List** the different types of learning.

CRITICAL THINKING

6. **Justifying Conclusions** Alcoholism runs in families. Does this mean that behavior is controlled only by genes? Why or why not?
7. **Justifying Conclusions** A newborn will turn toward a touch on the cheek and begin to suck. An older child will not. What two kinds of learning are demonstrated by this?

WRITING FOR SCIENCE

8. **Essay** Write a short essay about the costs and benefits of lions living together. Include in your argument the factors that influence the lions' behavior. Can you relate any of these costs and benefits to why humans usually live in groups?

Close

Formative Assessment

Young children learn to build a tower of blocks by repeating their efforts until they succeed. What type of learning or behavior are the children demonstrating?

A. habituation (Incorrect. Habituation involves learning to ignore or reduce the response to a certain stimulus—not a consideration in building a block tower.)

B. problem solving (Correct. The children learn from each trial how to accomplish the task of building a tower.)

C. instinctive behavior (Incorrect. The ability to build a block tower is not influenced by genes.)

D. classical conditioning (Incorrect. Building a block tower does not involve a stimulus being followed by an unrelated, conditioned response.)

Answers to Section Review

1. "how" questions and "why" questions
2. Behavior is controlled by both genetic and environmental factors.
3. Natural selection favors traits (such as behaviors) that increase an individual's reproductive success.
4. Innate behaviors may be greatly influenced by genes, but these behaviors are not necessarily fixed. Innate behaviors are not learned, but may be modified by experience.
5. habituation, problem solving, classical conditioning, imprinting, and operant conditioning
6. False. Behavior is influenced by genes and the environment. Some behaviors are controlled almost exclusively by genes, but most are modified and shaped by the environment.
7. innate (or instinctive) behavior and imprinting
8. Essays should include the following ideas: benefit—catching big prey and protecting their cubs; cost—sharing food with the group and a decrease in the reproductive success of some individuals.
   Sample answers that relate to humans would include family groups that live together to raise children; group living benefits children because they have access to more resources.