

Chapter 51: Animal Behavior

- 51.1** *Compare and contrast the role of environmental changes and animal communication in triggering animal behavior.*
- 51.2** *Use examples to illustrate the diverse forms of learning observed among animal species.*
- 51.3** *Discuss how foraging and reproductive behavior can evolve as responses to selection for relative fitness.*
- 51.4** *Explain how genetic and quantitative analyses are used in exploring and modeling selection for particular behaviors.*

This chapter may be one of your favorites, as it will cause you to consider behaviors you have noticed and lead you to question how the behavior could affect natural selection. Behaviors of an individual serve to increase its fitness in the population and are vital to reproduction and survival. Throughout this course, you have seen numerous examples of communication beginning with a signal which leads to a response. In this chapter you see that this occurs not only at the cellular level, but also at the level of the organism and population. There are myriad environmental cues that elicit responses.

Study Tip: Throughout this chapter, watch for how each of the four questions presented in Figure 51.1 in your text are used to analyze *how* behaviors occur and *why* they arise. List the four questions in the space below as you read the examples utilizing the magnificent frigatebird. Can you think of behaviors you have observed and how those behaviors fit into these four questions?

Concept 51.1 *Discrete sensory inputs can stimulate both simple and complex behaviors*

LO 51.1: *Compare and contrast the role of environmental changes and animal communication in triggering animal behavior.*

1. How is *behavior* defined? Why are behaviors subject to natural selection?
2. Nicholas Tinbergen was a pioneer in the study of animal behavior. He framed the four questions presented in the opening figure. His work with the stickleback fish is a classic study. Explain what he found, using the terms *fixed action pattern* and *sign stimulus* in your response.

3. What is migration?
4. Explain what is meant by *circadian clock* and *circadian rhythms*. Identify two behaviors, either plant or animal, that demonstrate a circadian rhythm. (You may need to refer to Chapter 40 or Chapter 49 for examples.)
5. Discuss two navigational strategies used by birds to migrate.
6. Animals communicate in various ways. Discuss at least three specific examples using different organisms.
7. Figure 51.4 in your text shows one step in fruit fly courtship behavior. What different modes of communication are used by the fruit fly?
8. Karl von Frisch studied European honeybees. What are the two types of dances that a returning worker bee does, and what information does each dance convey?
9. Make a labeled sketch that indicates a nectar source is distant from the hive and 45° to the right of the sun.
10. What are *pheromones*? Give three specific types of information that can be transmitted through pheromones. (Do you respond to pheromones, or signal with pheromones?)

Concept 51.2 *Learning establishes specific links between experience and behavior***LO 51.2:** *Use examples to illustrate the diverse forms of learning observed among animal species.*

11. What is the difference between *innate* and *learned* behavior?
12. Give an example of each type of behavior and describe how the behavior increases fitness. (It is likely you will find your best examples by considering various behaviors you have seen and considering whether it is innate or learned. Pets are a good source of behavior examples.)

Behavior Type	Example	How It Increases Fitness
Innate		
Learned		

13. Describe the process of *imprinting* and explain what is meant by the *sensitive* or *critical period*.
14. Describe the classic study of *parental imprinting* done by Konrad Lorenz.
15. What special challenges did researchers face in order to return captive-raised whooping cranes to the wild? What would you have to wear if you worked with hatchlings? Why?
16. There are several types of learning. What occurs in *spatial learning*?
17. What is *associative learning*?

18. Monarch butterflies pupate on milkweed plants, and their caterpillars and adults incorporate toxic compounds from these plants. If a blue jay feeds on a monarch butterfly, it will vomit almost immediately. There is a monarch mimic, the viceroy butterfly. What does associative learning predict will be a blue jay's response to viceroys?
19. Describe *classical conditioning* used by Ivan Pavlov with dogs.
20. How is *classical conditioning* different from *operant conditioning*?
21. What is *cognition*? Give three examples of cognition in animal species, including at least one bird behavior among them.
22. Many bird songs are learned during a *sensitive period*. What will happen if a white-crowned sparrow does not hear the song of its species during this time?
23. Describe an example of *social learning*.

Concept 51.3 *Selection for individual survival and reproductive success can explain diverse behaviors*

LO 51.3: *Discuss how foraging and reproductive behavior can evolve as responses to selection for relative fitness.*

24. What is *foraging behavior*?
25. What is proposed by the *optimal foraging model*? Explain it in terms of cost and benefit and cite two examples from your text.

26. To demonstrate that you understand the principle of optimal foraging, describe a food source that you would not be likely to exploit and explain why.
27. There are several different possible mating systems. For each, give an example of a species that uses the system *and* an underlying evolutionary benefit of the system.

Mating System	Example	Evolutionary Benefit
promiscuity		
monogamy		
polygamy		
polygyny		
polyandry		

28. Name a species that exhibits sexual dimorphism. Which mating system does this favor?
29. Explain two factors that may be important in determining the evolution of these mating systems and apply each factor to a particular species.
30. Let's return to an earlier idea from Chapter 23. What is *sexual selection*?

31. There are two types of sexual selection. Explain each of them and provide an example.

intersexual selection

intrasexual selection

32. How can *mate choice* increase fitness?

Describe mate-choice copying including how this behavior might evolve.

33. What is *agonistic behavior*? Give one example of this behavior that is not in your book.

34. How can game theory be applied to evolutionary problems of reproductive success?

Concept 51.4 Genetic analyses and the concept of inclusive fitness provide a basis for studying the evolution of behavior

LO 51.4: Explain how genetic and quantitative analyses are used in exploring and modeling selection for particular behaviors.

35. Explain how the *fru* gene demonstrates a genetic basis of behavior.
36. What is *altruism*?
37. Explain the evolutionary advantage to a population of having members who exhibit *altruistic behavior*.
38. *Altruism* may reduce the fitness of an individual—for example, by making that individual more obvious to a predator. Explain this behavior using the concept of *inclusive fitness*.

39. Explain the logic behind geneticist J. B. S. Haldane's comment that he would lay down his life for two brothers or eight cousins.
40. Contrast *kin selection* and *reciprocal altruism*.

Test Your Understanding, p. 1161.

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____