

ing during a lifetime” hypothesis (1) and “adaptive specialization” hypothesis (2)? One of many potential experiments could involve cross-fostering, a technique commonly used for examining the effects of an animal’s environment on the expression of behavior (see Chapter 7, *Song Learning and Mate Choice in Cowbirds*). Our cross-fostering experiment would entail switching the eggs of doves from the group foraging population with eggs of doves from the territorial population. By doing so, we can be relatively confident that the young doves have not yet had the opportunity to learn about their environment (but see Colombelli-Négrel et al. 2012 for a fascinating account of embryonic learning of bird song!). If “learning during a lifetime” shapes the doves’ ability to conduct complex learning tasks, we might predict the cross-fostered young from the group-foraging population to exhibit similar learning curves as individuals from the territorial population (in which they now reside), and vice versa. If natural selection produced adaptive specializations in each dove population, we might not expect the cross-fostering experiment to have much of an impact on the learning curves of the individuals that were switched between populations relative to individuals who were not switched. Carlier and Lefebvre’s (1996) fascinating paper and our follow-up experiment highlight the two major aspects of this chapter on learning—how drawing on past experience can adjust individual behavior during a lifetime *and* how natural selection can shape the propensity to learn.

MULTIPLE-CHOICE QUESTIONS

1. Sensitization is the process by which:
 - a. animals become less likely to exhibit a response to a stimulus over time.
 - b. animals become more likely to exhibit a response to a stimulus over time.
 - c. learning to associate one CS with a US blocks the ability to associate another CS with the same US.
 - d. one event predicts the occurrence of a second event.
 - e. one event predicts that a second event will not occur.
2. Appetitive stimulus is to excitatory conditioning as _____ is to _____.
 - a. sensitized stimulus; habituation
 - b. blocking; positive reinforcement
 - c. negative stimulus; operant conditioning
 - d. aversive stimulus; inhibitory conditioning
 - e. classical conditioning; instrumental conditioning
3. Which of the following statements or phrases is NOT associated with the law of effect?
 - a. second-order classical conditioning
 - b. associations between stimulus and response being strengthened if the response to a stimulus is followed by a positive reinforcer

- c. Thorndike's early work on instrumental learning in cats using puzzle boxes
 - d. instrumental conditioning and operant responses
 - e. associations between stimulus and response being weakened if the response to a stimulus is followed by a negative reinforcer
4. Learning is best defined as:
- a. a process by which only aversive stimuli elicit changes in behavior.
 - b. a permanent change in behavior resulting from hormonal but not neurobiological changes.
 - c. a relatively permanent change in behavior as a result of experience.
 - d. changes in behavior that result from past experience.
 - e. a process by which only positive stimuli elicit changes in behavior.
5. An unconditioned stimulus is a stimulus that:
- a. reinforces certain behavioral responses.
 - b. an animal habituates to immediately.
 - c. fails to elicit a response unless associated with a second stimulus.
 - d. inhibits an animal from performing certain behavioral responses.
 - e. elicits a response in the absence of training.
6. When psychologists construct extinction curves, they are examining:
- a. the lifespan of the organism in question.
 - b. the strength of an animal's behavioral response to instrumental conditioning.
 - c. how long an animal recalls associated events when continuously exposed to paired stimuli.
 - d. how long an animal remembers a paired association once the pairing has stopped.
 - e. how long it takes for sensitization to occur.
7. Phenotypic plasticity refers to the ability of an organism to adopt:
- a. alternative phenotypes depending on environmental and/or social conditions.
 - b. many different phenotypes simultaneously.
 - c. different morphological phenotypes with no change in behavioral phenotype.
 - d. different behavioral phenotypes within no change in morphological phenotype.
 - e. one specific phenotype that is fixed throughout the organism's lifetime.
8. David Stephens's model of learning and environmental stability predicts that learning will be favored when environmental predictability is:
- a. low within an individual's lifetime but high between generations.
 - b. high within an individual's lifetime and between generations.
 - c. high within an individual's lifetime but low between generations.

- d. low within an individual's lifetime and between generations.
 - e. intermediate within an individual's lifetime and high between generations.
9. Instrumental conditioning involves:
- a. providing positive reinforcement only during conditioning.
 - b. pairing of an unconditioned and conditioned stimulus.
 - c. habituating the subjects to certain stimuli.
 - d. preventing the animal from performing specific behaviors during the conditioning process.
 - e. positive and/or negative reinforcement of a behavioral response.
10. Which of the following scientists revolutionized the field of instrumental learning by developing an apparatus wherein lever pushing would deliver a reward?
- a. B. F. Skinner
 - b. Ivan Pavlov
 - c. Edward Thorndike
 - d. John Garcia
 - e. Harry Harlow

REVIEW AND CHALLENGE QUESTIONS

1. Discuss the general differences between Pavlovian (classical) conditioning and operant conditioning. In terms of what we can glean about animal learning, what are some similarities and differences between these two conditioning paradigms?
2. Why were Garcia's studies on rats in the mid-1960s important for initiating the study of learning from an evolutionary perspective?
3. What types of environments would be conducive to natural selection favoring the ability to learn? Discuss your answer in terms of David Stephens' dichotomy between within- and between-lifetime environmental stability. Also, read the paper by Dunlap & Stephens (2009) titled "Components of Change in the Evolution of Learning and Unlearned Preference" (*Proceedings of the Royal Society of London Series B*, vol. 276, pp. 3201–3208). Briefly describe the mathematical model that the authors present, focusing particularly on how "reliability of experience" and "predictability of the best action" are factored into the model. Next, describe the experimental evolution approach taken by the authors to test the predictions of their model. What did they find? What do their data say about the factors that influence the evolution of learning?
4. Read the paper by Kotrschal and colleagues (2013), "Artificial Selection on Relative Brain Size in the Guppy Reveals Costs and Benefits of Evolving a