**Discussion Questions**

to accompany

***Animal Behavior,* Eleventh Edition**

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**Chapter 1**

**An Introduction to Animal Behavior**

1.1 To explain how the blind process of natural selection—a process dependent on random events (mutations)—can generate complex adaptations, Richard Dawkins invites us to imagine that an evolved attribute is like an English sentence—like a line from Shakespeare’s *Hamlet*, such as, METHINKS IT IS LIKE A WEASEL (Dawkins 1986). The odds that a monkey would produce this line by tapping at a typewriter are vanishingly small, 1 in 10,000 million million million million million million (1 in 1040). These are not good odds. But instead of trying to get a monkey or a computer to get the “right” sentence in one go, let’s change the rules so that we start with a randomly generated letter set, such as SWAJS MEIURNZMMVASJDNA YPQZK. Now we get a computer to copy this “sentence” over and over, but with a small error rate. From time to time, we ask the computer to scan the list and pick the sequence that is closest to METHINKS IT IS LIKE A WEASEL. Whatever “sentence” is closest is used for the next generation of copying, again with a few errors thrown in. The sentence in this group that is most similar to METHINKS … WEASEL is selected to be copied, and so on. Dawkins found that this approach required only 40 to 70 runs (generations) to reach the target sentence. What was Dawkins’s main point in illustrating what he called cumulative selection? In what sense is this example not a perfect analogy for natural selection?

1.2 Because the reproductive success of female Hanuman langurs (*Semnopithecus entellus*) is almost certainly lowered when a newly installed male kills their young infants, selection should favor countermeasures against infanticidal males. In this light, why might already pregnant females mate with a new male soon after a takeover even though they are not ovulating? What significance do you attach to the discovery that when mares are impregnated by stallions at stables away from their home locations, they will also copulate repeatedly with the males in their home stables upon their return (Bartoš et al. 2011)?

1.3 Many people think that an adaptation is a trait that improves the survival chances of an organism. Under what circumstances would a survival-enhancing attribute be selected against?

1.4 Stephen Jay Gould and Richard Lewontin claimed that adaptationists—a group that contains most of the world’s behavioral biologists—often make the elementary mistake of believing that every characteristic of living things is a perfected product of natural selection (Gould and Lewontin 1979), when in reality many attributes of living things are not adaptations. One of the effects of making this mistake is, according to Gould and Lewontin, the tendency of adaptationists to invent fables as absurd as the fictional “just so stories” of Rudyard Kipling, who made up amusingly silly explanations for the leopard’s spots and the camel’s hump. How might adaptationists defend themselves against these charges? Do adaptationists have the means to discover whether an evolutionary explanation for a particular trait is wrong?

1.5 As is true for many issues in biology, scientists have proposed a number of competing definitions for *adaptation* (see Harvey and Pagel 1991, Lauder et al. 1993, Reeve and Sherman 1993). For some, the term must be reserved for a characteristic that provides “current utility to the organism and [has] been generated historically through the action of natural selection for its current biological role.” What do you think *current utility* means? If a trait originated for function X and later took on a different, but still adaptive, biological role Y, does that mean it is not an adaptation? Track down the evolutionary history of the flight feathers of modern birds (see Prum and Brush 2002). Where did these feathers come from, and what function did their predecessor feathers exhibit? If you go back far enough in time, will the ancestral form of any current trait have the same function that it does now?

1.6 The four main questions for behavioral researchers according to Niko Tinbergen (Tinbergen 1963) can be paraphrased as follows:

1. How does the behavior promote an animal’s ability to survive and reproduce?
2. How does an animal use its sensory and motor abilities to activate and modify its behavior patterns?
3. How does an animal’s behavior change during its growth, especially in response to the experiences that it has while maturing?
4. How does an animal’s behavior compare with that of other closely related species, and what does this tell us about the origins of its behavior and the changes that have occurred during the history of the species?

Place these questions within the levels-of-analysis framework, and then assign each to the proximate or ultimate category. If you heard that because evolutionary questions are “ultimate” ones, they are therefore more important than questions about proximate causes, you would respectfully disagree. Why?

1.7 When a female yellow baboon (*Papio cynocephalus*) copulates, she vocalizes loudly, but her cries are longer and louder if her partner happens to be a high-ranking, “alpha” male (Semple et al. 2002). A primate researcher has suggested that females cry out more vigorously when copulating with top males because this warns low-ranking baboons to stay clear. Subordinate males sometimes harass mating pairs to such an extent that the copulation ends prematurely, but if that happens, they may be attacked by the dominant male whose mating they so rudely interrupted. The same researcher also says, however, that the more vigorous cries may simply reflect the fact that females are more strongly stimulated by the larger, more energetic, alpha males. Use the proximate–ultimate distinction to establish which view is correct.

References

Bartoš, L., Bartošová, J., Pluháček, J., and Sindelářová, J. 2011. Promiscuous behaviour disrupts pregnancy block in domestic horse mares. *Behavioral Ecology and Sociobiology* 65: 1567–1572.

Dawkins, R. 1986. *The Blind Watchmaker*. New York: W.W. Norton.

Gould, S. J., and Lewontin, R. C. 1979. The spandrels of San Marco and the Panglossian paradigm: A critique of the adaptationist programme. *Proceedings of the Royal Society of London B* 205: 581–598.

Harvey, P. H., and Pagel, M. D. 1991. *The Comparative Method in Evolutionary Biology*. London: Oxford University Press.

Lauder, G. V., Leroi, A. M., and Rose, M. R. 1993. Adaptations and history. *Trends in Ecology and Evolution* 8: 294–297.

Prum, R. O., and Brush, A. H. 2002. The evolutionary origin and diversification of feathers. *Quarterly Review of Biology* 77: 261–295.

Reeve, H. K., and Sherman, P. W. 1993. Adaptation and the goals of evolutionary research. *Quarterly Review of Biology* 68: 1–32.

Semple, S., McComb, K., Alberts, S., and Altmann, J. 2002. Information content of female copulation calls in yellow baboons. *American Journal of Primatology* 56: 43–56.

Tinbergen, N. 1963. On the aims and methods of ethology. *Zeitschrift fur Tierpsychologie* 20: 410–433.