

**Big Idea 3: Living
systems store, retrieve,
transmit and respond
to information essential
to life processes.**

Enduring understanding 3.E:
Transmission of information results
in changes within and between
biological systems.

Essential knowledge 3.E.1: Individuals can act on information and communicate it to others.

a. Organisms exchange information with each other in response to internal changes and external cues, which can change behavior.

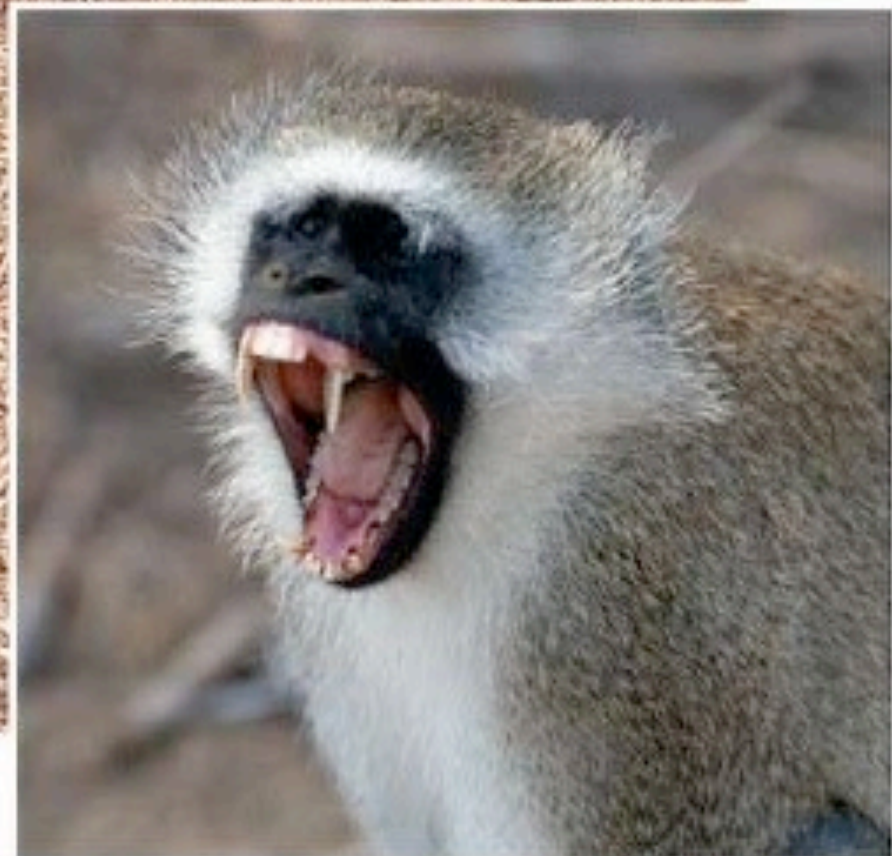
Students should be able to demonstrate understanding of the above concept by using an illustrative example such as:

- Fight or flight response
- Predator warnings
- Protection of young
- Plant-plant interactions due to herbivory
- Avoidance responses

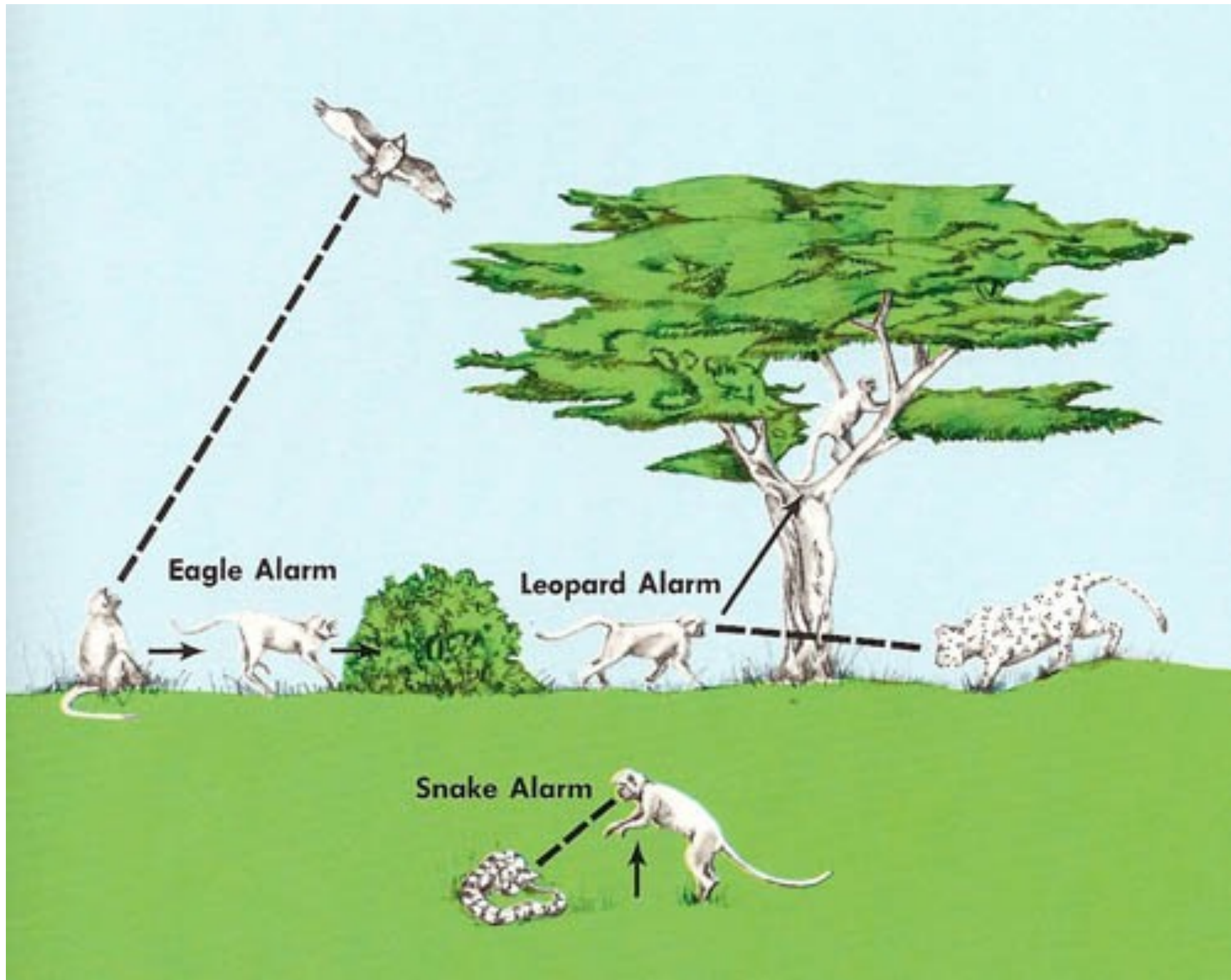
Fig. 51-31



**Vervet
monkeys
produce
distinct alarm
calls for
different
predators**



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Essential knowledge 3.E.1: Individuals can act on information and communicate it to others.

b. Communication occurs through various mechanisms.

Evidence of student learning is a demonstrated understanding of each of the following:

1. Living systems have a variety of signal behaviors or cues that produce changes in the behavior of other organisms and can result in differential reproductive success.

To foster student understanding of this concept, instructors can choose an illustrative example such as:

- Herbivory responses
- Territorial marking in mammals
- Coloration in flowers

Honey bees are sensitive to odors (including pheromones), tastes, and colors, including ultraviolet. They can demonstrate capabilities such as color discrimination through classical and operant conditioning and retain this information for several days at least; they communicate the location and nature of sources of food; they adjust their foraging to the times at which food is available; they may even form cognitive maps of their surroundings.



we see...



bee's see...

Essential knowledge 3.E.1: Individuals can act on information and communicate it to others.

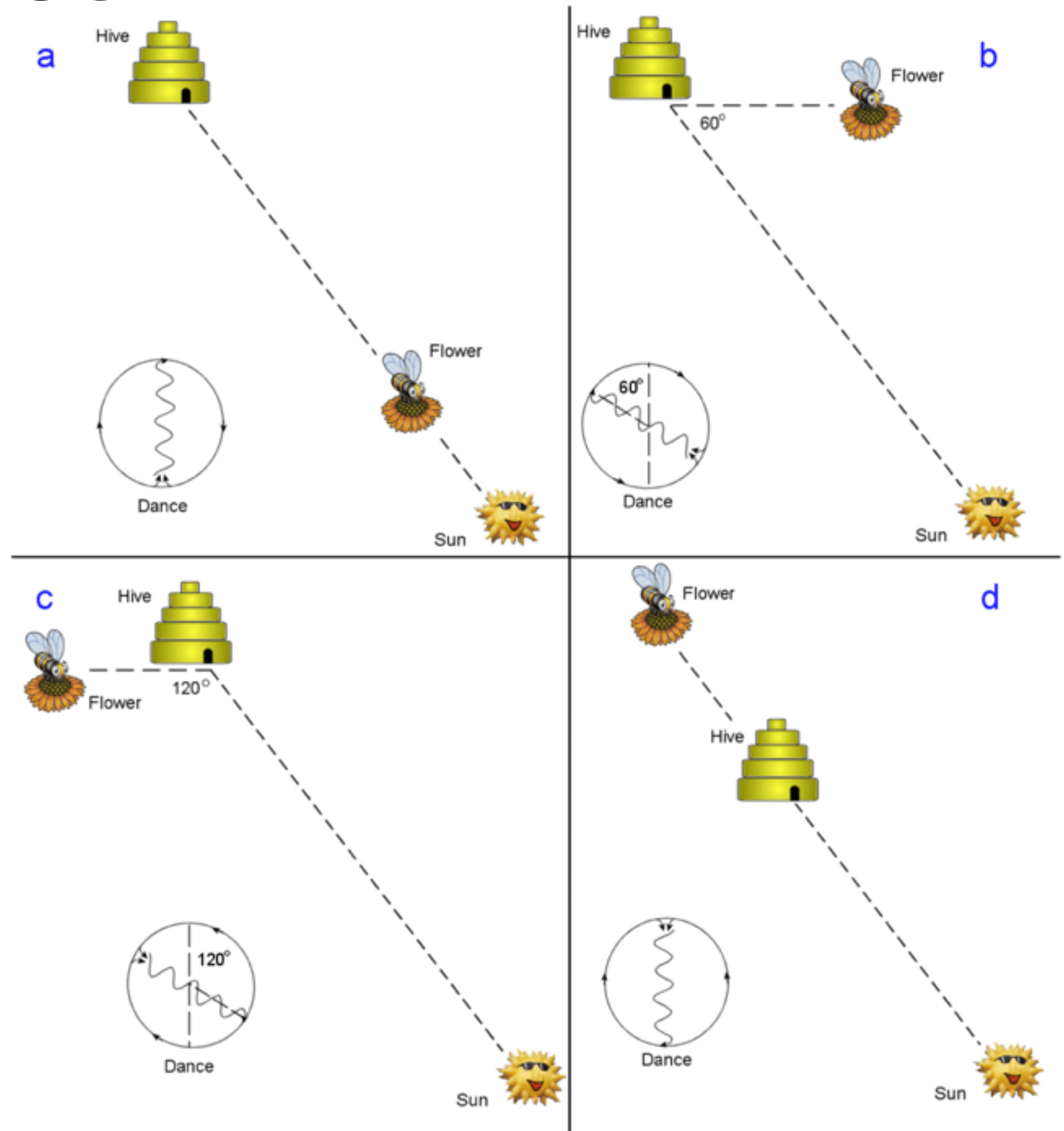
2. Animals use visual, audible, tactile, electrical and chemical signals to indicate dominance, find food, establish territory and ensure reproductive success.

To foster student understanding of this concept, instructors can choose an illustrative example such as:

- Bee dances
- Birds songs
- Territorial marking in mammals
- Pack behavior in animals
- Herd, flock, and schooling behavior in animals
- Predator warning
- Colony and swarming behavior in insects
- Coloration

Bee Dance

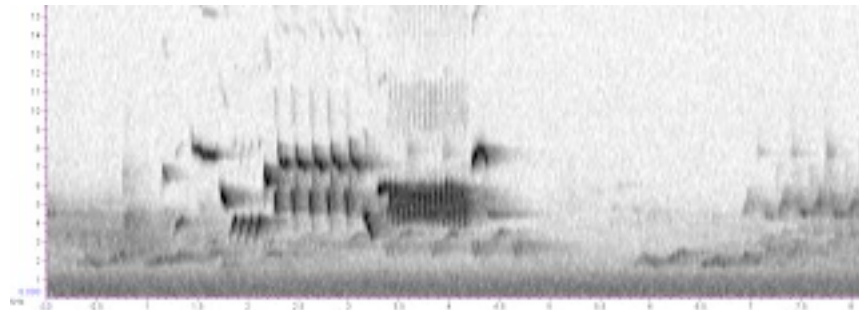
Bee waggle dance includes direction relative to the sun.



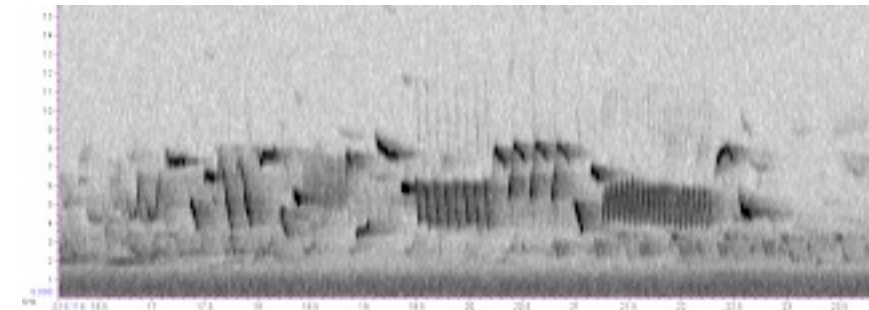
Bird Songs

The songs of different species of birds vary and are generally typical of the species. Species vary greatly in the complexity of their songs and in the number of distinct kinds of song they sing

European Wren



North American Wren



Warning Coloration

Aposematism, perhaps most commonly known in the context of warning coloration, describes a family of antipredator adaptations in which a warning signal is associated with the unprofitability of a prey item to potential predators. Aposematism involves an advertising signal. The warning signal may take the form of conspicuous animal coloration, sounds, odours or other perceivable characteristics.



Essential knowledge 3.E.1: Individuals can act on information and communicate it to others.

c. Responses to information and communication of information are vital to natural selection and evolution. [See also 1.A.2]

Evidence of student learning is a demonstrated understanding of the following:

1. Natural selection favors innate and learned behaviors that increase survival and reproductive fitness.

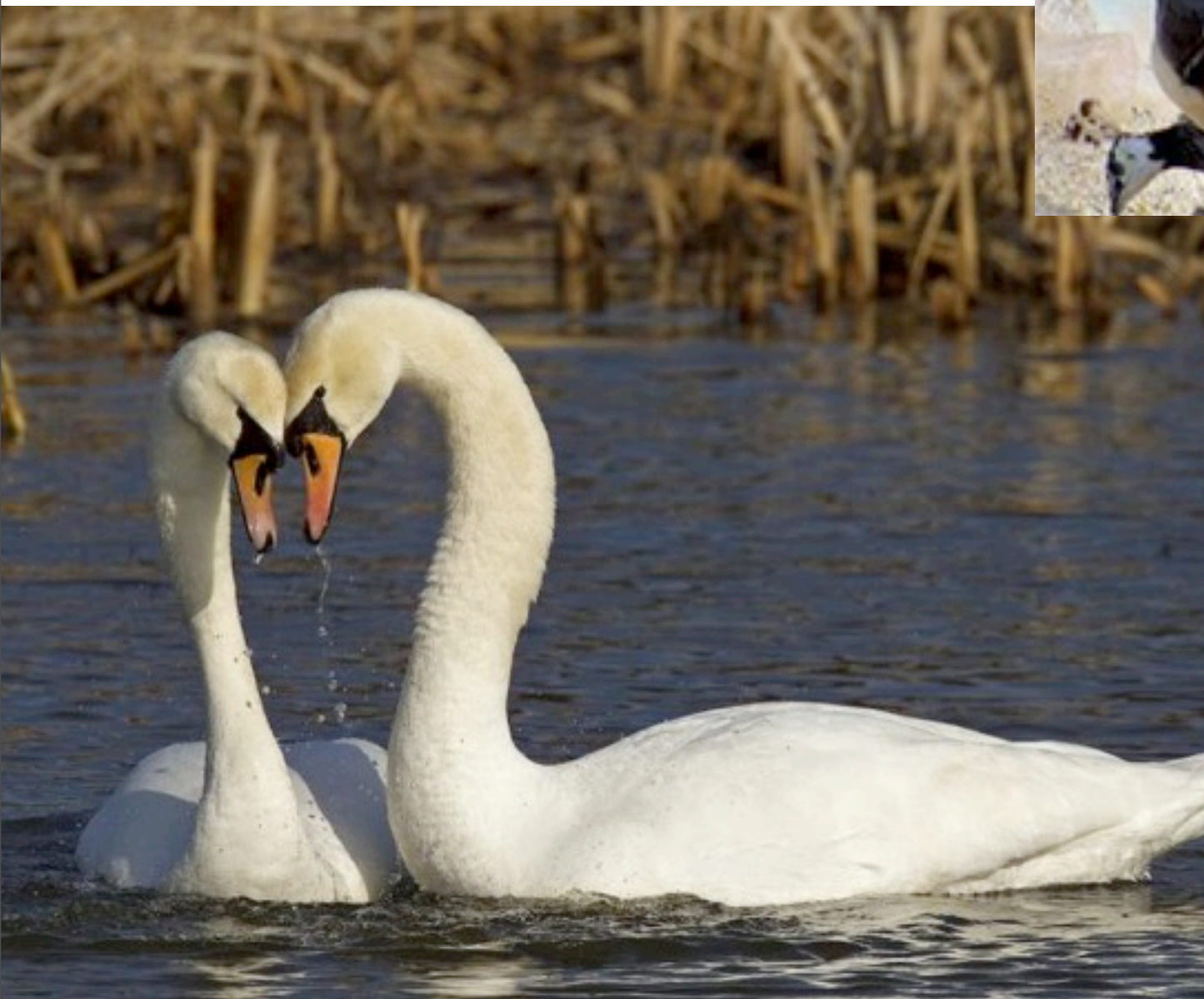
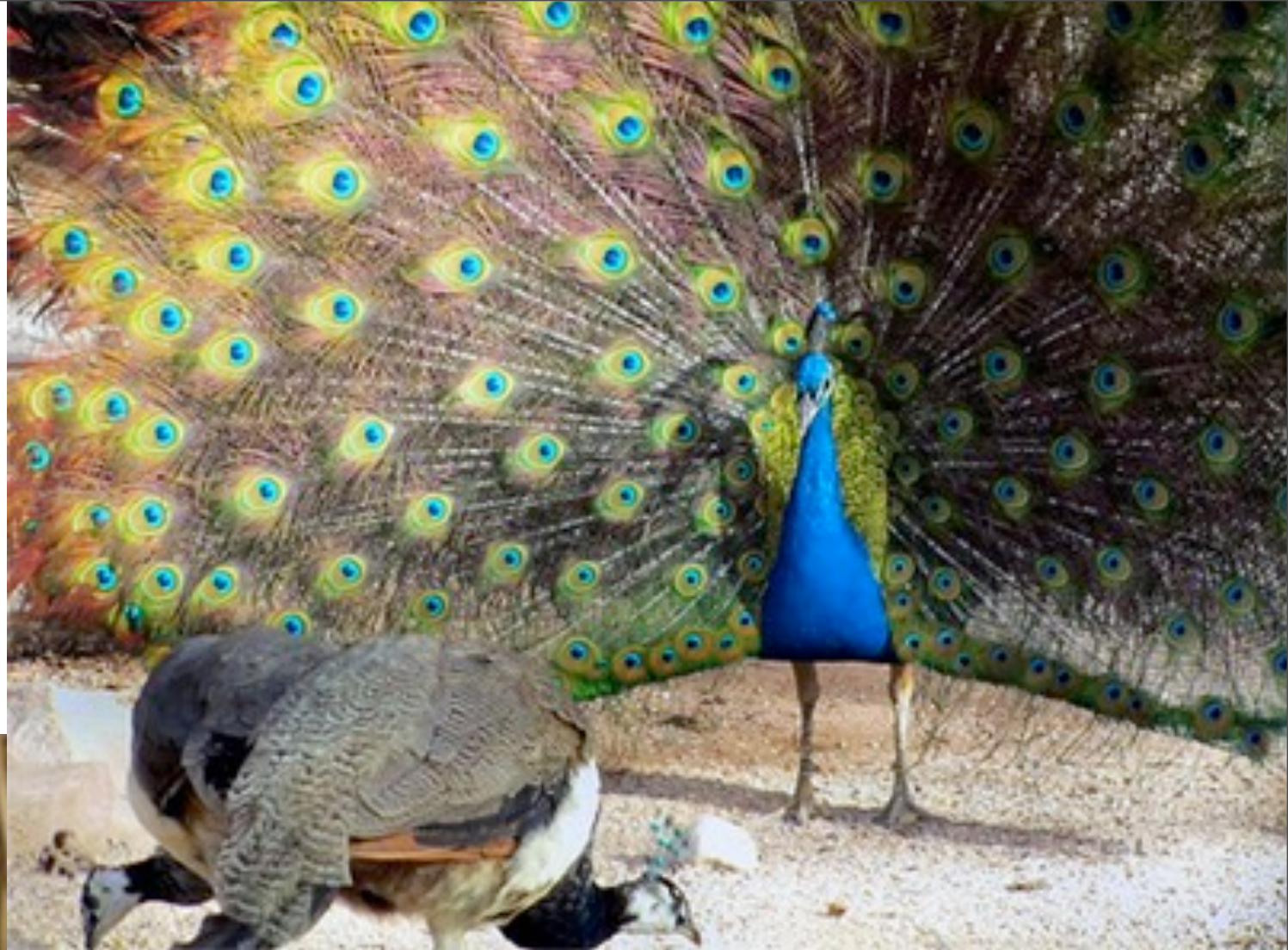
Students should be able to demonstrate understanding of the above concept by using an illustrative example such as:

- Parent and offspring interactions
- Migration patterns
- Courtship and mating behaviors
- Foraging in bees and other animals
- Avoidance behavior to electric fences, poisons, or traps

Parent Offspring Interactions



Courtship & Mating Behaviors



Essential knowledge 3.E.1: Individuals can act on information and communicate it to others.

2. Cooperative behavior tends to increase the fitness of the individual and the survival of the population.

To foster student understanding of this concept, instructors can choose an illustrative example such as:

- Pack behavior in animals
- Herd, flock and schooling behavior in animals
- Predator warning
- Colony and swarming behavior in insects

XX The details of the various communications and community behavioral systems are beyond the scope of the course and the AP Exam.

Pack Behavior (Hunting)



Herd, Flocks and Schooling



Learning Objectives:

LO 3.40 The student is able to analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior. [See SP 5.1]

LO 3.41 The student is able to create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior. [See SP 1.1]

LO 3.42 The student is able to describe how organisms exchange information in response to internal changes or environmental cues. [See SP 7.1]