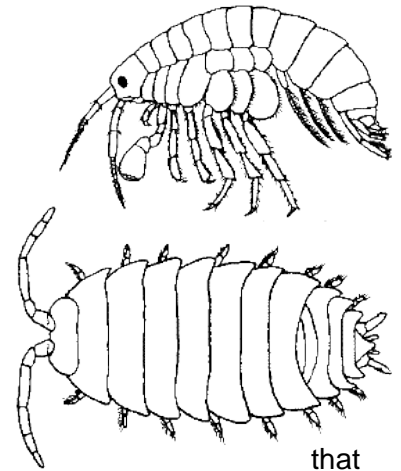


Name(s): _____

Investigation: Animal Behavior

Part 1: Nature versus Nurture

Whether you are watching an animal documentary on TV, playing with your dog outside or idly watching fish in an aquarium, you are observing animal behavior. Some behaviors may be puzzling, like the toads in the spring that start to chirp or the aggressive actions of a sea lion on a dock. The reasons for the behaviors may not always be clear and scientists studying behavior often wrestle with a fundamental question about the origins of the behavior. Behaviors fall into two broad categories:

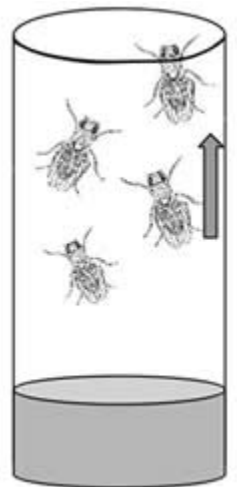


Learned Behavior: Behavior that an animal is not born with, but one develops through experience. Animals can be trained using positive and negative reinforcement to avoid or reinforce behaviors. For example, a dog that receives a treat for sitting will learn the sit command.

Innate Behavior: This behavior is something an animal is born with, they are sometimes referred to as instincts or intrinsic behavior. Questions arise about these behaviors because it may not always be clear what purpose they serve. Biologists also explore the genetics of behavior, making an assumption that the code for innate behaviors must be found within the DNA of the organism and passed from one generation to the next.

1. Suggest 2 types of learned behaviors and two innate behaviors that you have observed in animals (cats, dogs, whales, humans)

2. Why would it be assumed that innate behaviors were coded somewhere in DNA? How could this assumption be tested?



3. Fruit flies display **geotaxis**, or a response to the earth's gravity. If the flies are within a vial and the vial is flipped upside down, the flies will move crawl to the top of the vial. A researcher notices that a group of flies that had been exposed to radiation no longer exhibit geotaxis. How could you provide further evidence that this behavior is innate and not learned?

Part 2: How (and Why) is Behavior Studied?

Ethology is the study of animal behavior and is most often concerned with the innate behaviors. Biologists study animal behavior from two different points of view:

Proximate questions address the mechanisms that produce a behavior: the environmental stimuli that trigger a behavior and the genetic and physiological mechanisms that make it possible. For example, *how* does an animal carry out a behavior?

Ultimate questions address the evolutionary significance of a behavior: how a behavior increases the evolutionary fitness of the animal demonstrating it, helping it to survive and reproduce in its environment. For example, *why* does the animal show this behavior?

What regulates behavior? Organisms use **feedback mechanisms** to regulate growth and reproduction and to maintain dynamic homeostasis. Organisms respond to changes in their internal and external environments through behavior and physiological mechanisms. In animals, these mechanisms include migration, sweating, shivering, or going into hibernation. Organisms use **negative feedback** mechanisms to maintain their internal environments by returning the changing condition back to its set point. Examples of negative feedback responses include temperature regulation in animals, and responses to drought in plants.

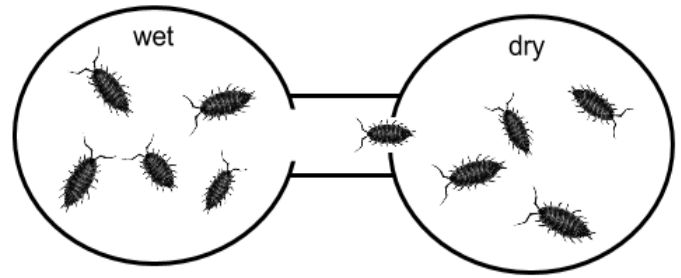
Orientation is a process by which animals position themselves with respect to spatial features of their environments. **Taxis** involves the turning of an animal's body relative to a stimulus - either toward or away, like the fruit flies that move in response to gravity. There are several types of taxis (geotaxis, phototaxis, chemotaxis.)

Taxis can also be **negative** where the animal avoids the stimulus, or **positive**, where the animal moves toward the stimulus. **Kinesis** is a random movement of an animal in relation to a stimulus, like cockroaches scattering when the light is turned on.

4. Suggest an evolutionary reason that fruit flies exhibit geotaxis.
5. Provide an example of negative feedback mechanisms that can be observed in humans.
6. Suggest a stimulus that a baby would exhibit a negative taxis. Positive taxis?
7. Provide an example of a proximate question related to isopods.
8. Provide an example of an ultimate question related to isopods.

Part 3: Design and Investigate

For this investigation, you will be provided with a "choice chamber" which allows you to create two separate environments to test as shown in the example below. We will use isopods collected from the school grounds. It is important to consider the safety of your animal specimens, your goal here is to observe and not harm the organism.



Research Questions: To what stimuli do isopods exhibit negative taxis? To what stimuli do they exhibit positive taxis? (Stimuli possibilities: acidity (vinegar), sugar, salt, gravity, light, temperature)

Design Experiments: Pay attention to how you will control variables so that you are only testing the organism's response to a single factor. After your teacher approves your design, you will move to the test phase. You will need to test multiple factors and/or share your data with other groups to develop a comprehensive answer to your research question.

Gather Data: Design a data table to record the movements of your specimens. Attach a page that shows an organized table that tracks at least 2 variables. You may also include multiple data sets (tables.) Attach page to this one.

Time (minutes)	# In Wet Chamber	# In Dry Chamber
0	5	5
1	5	5
2	6	4
3	6	4

Summarize

a) To what stimuli do the specimens exhibit **negative or positive taxis**? Use your data to support your claim. *Perform a chi square analysis on your data to show that differences in behavior are statistically significant.

b) Describe how one observed behavior is related to **homeostasis**?

c) Suggest reasons for the observed behavior; consider it from an evolutionary point of view (**Ultimate Question**)

d) How could you have improved your design?