Metaphors, Analogies, and Scaling

Part A: Develop at least two (2) one-word metaphors, and two analogies to explain a scientific concept to a lay audience.

Scientific Concept: Optimal Foraging Theory (Behavioral Ecology)

Calculation Metaphor

Organisms choose their prey by <u>calculating</u> which option will provide them with more energy.

Endorsing Behaviors Metaphor

Evolution will <u>endorse</u> behaviors that maximize the energy gained from foraging.

Menu Analogy

In a habitat, organisms choose their prey like they are reading a menu. Deciding which prey to eat and which to ignore is like analyzing a menu based on the cost, rarity, and flavor of each dish. Taste is analogous to the energy gained from consuming a type of prey. For example, a praying mantis is looking at a menu and can order either a fly or a grasshopper. They know that grasshoppers are rare and expensive but are the tastiest of the two. The praying mantis can order flies at any restaurant and they are a much cheaper meal than grasshoppers. However, flies are nowhere near as tasty as a grasshopper. In this case, the praying mantis would always order the grasshopper if it is on the menu. This aligns with foraging theory, which would argue that the praying mantis would always search for the better prey item and not the lesser; however, they will occasionally consume lower quality items when encountered during the search for a high value item (like ordering an appetizer).

Cooking vs. Fast Food Analogy

In reality, optimal foraging decisions are made from an organism's current hunger level. This is analogous to choosing where to eat dinner. If I am very hungry or starving, I will be more inclined to eat fast food, but if I am only somewhat hungry, I will likely put in effort to cook myself a healthy meal. Just like my food choices, organisms will eat more easily accessible but lower quality prey items when they are starving but make an effort to search for high quality prey when they are less hungry. Some days I am very hungry at dinnertime, and others I am willing to cook for myself. This leads to a mix of food types in the diet, and in the animal kingdom, something known as partial prey preference.

Part B: Develop two (2) scaling strategies to give audiences an enhanced appreciation for non-human scales; each scale should treat a different metric: time, size, mass, etc.

Strategy 1: Using noise as a strategy to demonstrate mass. Volume could be scaled to approximately match the weight or mass of an organism relative to others. For example, tiny plankton would elicit a very quiet, almost inaudible sound, while a bird would have an audible but not loud sound. A human would be associated with a louder sound, and a whale would be almost deafening.

Strategy 2: Using pipes in a building to scale for evolutionary time instead of a tree. The problem with the tree as a metaphor for evolution is that tree branches can grow in any way. However, pipes are designed in a certain way for a specific purpose. Each room can be analogous to taxa or kingdoms, and pipes branch out in specific places due to natural selection, portrayed in this metaphor as purposeful. The length of pipes can also represent time.