

AIM: Evolution and Diversity Ideas

- 1. Similarities among organisms found in anatomical features can be used to infer the degree of relatedness among organisms.**
 - Organisms of the same type have similar anatomical features. Some of these features can be seen with the naked eye, and some are microscopic.
 - The more closely related organisms are, the more similar their anatomy is likely to be; however, similar anatomy on its own does not prove relatedness.
 - Similar anatomical features are not always an indication of relatedness because sometimes distantly related organisms may evolve similar adaptations to similar environmental constraints.
- 2. In classifying organisms, biologists consider details of internal and external structures to be more important than behavior or general appearance.**
 - Classification is the grouping of organisms according to their relatedness.
 - General appearance can be used to consider relatedness of organisms, but is less reliable than specific anatomical features.
 - Similar behaviors (e.g., flight, nest-building, earth-digging) are more likely than anatomical features to be shared by diverse organisms.
- 3. Individuals of the same species differ in their traits, and sometimes the differences give individuals an advantage in surviving and reproducing.**
 - Organisms of the same type in a particular environment have variation in many of their characteristics.
 - Individual organisms with certain traits in particular environments are more likely than others to survive and have offspring.
 - Organisms inherit their traits from their parents. An individual with a trait that results in an advantage for survival and reproduction is more likely to have offspring that also have that advantageous trait. As these individuals survive and reproduce, their advantageous traits become more common in the population.
- 4. Organisms of different species have traits that enable them to survive and reproduce in particular environments.**
 - Organisms that have traits that best meet the challenges of their environment are most likely to survive and reproduce. Therefore, the organisms found in any particular environment are most likely to be those with traits that best meet the challenges in that environment.
 - A trait results in an advantage if it usually allows the number of individuals of that species to increase over time; a trait results in a disadvantage if it usually causes the number of individuals of that species to decrease.
 - A trait that results in an advantage in one environment may result in less or more of an advantage, result in a disadvantage, or be neutral in a different environment.
 - Different types of organisms may have different traits that allow them to meet the same environmental challenges. (For instance in a dry environment, animals may have leathery skin and plants may have a waxy covering, both of which decrease water loss.)
- 5. Different environments have different features that affect organisms' abilities to survive and reproduce. Some important features are climate, light level, soil nutrients, and the presence of other organisms.**

- Environments are not stable; they change from time to time. Environmental changes can be physical (e.g., temperature, rock slide), chemical (e.g., soil pH), biological (e.g., predators immigrating, competitors introduced) or a combination of these.

6. Evolution is a change in the frequency of heritable traits within a population or species over time. Evolution may result in new species developing, but does not always.

- Evolution is driven largely by *natural selection*, which is the survival and reproduction of organisms that carry traits that result in an advantage in a given environment. The environment constrains what traits result in an advantage and, therefore, which traits are most likely to be passed from generation to generation.
- Populations living in different environments can evolve different adaptations. When populations differ enough from one another, they are referred to as species.
- New traits arise through random mutation, not simply because the environment presents a need for them

7. Extinction of a species occurs when the environment changes and the variation in characteristics of the species is insufficient to allow its individuals to continue to survive and reproduce.

- If all members of a species die, the species becomes extinct.
- Extinction of a species results when individuals die before reproducing or do not reproduce enough to replace all individuals who die.
- Environmental changes that lead to the extinction of a type of organism often do so over time, such as through increased competition for limited resources, increased incidence of disease or parasites, or reduced ability to escape predators. Large-scale “catastrophic” changes in an environment may also produce extinctions.

8. Fossils indicate that many organisms that lived long ago are extinct. Extinction is common; most species of organisms that have lived on Earth no longer exist.

- There were many species in the past that were different than the ones that are alive today. We know this because we have a fossil record of some species that inhabited Earth in the past.
- Species can exist for long periods of time (many thousands to millions of years) before they become extinct. Becoming extinct does not mean a species was unsuccessful; any species may become extinct if its traits no longer result in an advantage in its environment.
- Fossils can provide scientists with records of organisms’ structures that help identify the organisms and provide information about where and how they lived.