

Variation

Variation is one of the most critical aspects of species survival. This variation may not always be as easy to find as color usually is, because it may be a behavioral tendency or a genetic (cellular code) modification that enables some individuals within a species to survive, while others, of the same species, will perish. Variation within a population, of a single species, is called **variability**. Variability is important if the environment, in which the species lives, changes (suddenly or drastically). When a species has a great deal of variation, then, some of the individuals within that species will likely survive when there is change.

Examples of variability include:

- Red fox (color of coat)
- Antibiotic resistance (bacteria)
- Banded snail (color of shell)

Natural selection happens when factors in the environment determines, or 'selects' which individuals, within a species, will be able to survive. If they are able to live long enough to reproduce, then those individuals with their 'survival adaptations (characteristics) will have offspring with similar survival characteristics.

Genetic Trait Variations

Inherited Variations

(Heritable) characteristics are those traits which are passed on to offspring directly from their parents. These traits are passed on by way of the genetic material that is combined from the parents during the process of sexual reproduction. Heritable traits include, structural and distinguishing characteristics, such as eye color, hair type, skin color and earlobes....

Non-inherited Variations

Non-inherited characteristics are acquired and not necessarily passed on from generation to generation. Athleticism, artistic ability, leadership qualities are all learned during the early years of life

Discrete

Discrete variations are differences in characteristics that have a definite form. This includes those individuals, within a species, that have either one characteristic, or the single, other variation, of the characteristic

Examples ...

Thumb
Earlobe
Dimples
Hairline
Blood Type
Handedness

Continuous

Continuous variations are differences in characteristics that have a multitude of variations, such as height, shoe size, etc

Examples ...

Weight
Height
Shoe Size
Skin Pigmentation
Bone Density
Hand Span

Variation and the Environment

Some variations may be influenced by interactions with the environment. These variations are not inherited. Examples include:

- Change in the pigmentation of skin color throughout the seasons due to the sun.
- Height and weight can be influenced by diet.

Examples ...

IQ
Weight
Athleticism
Leadership
Knowledge

Asexual and Sexual Reproduction

Asexual reproduction involves only one parent. All of the offspring are identical to the parent. There are different types of asexual reproduction:

- **Binary Fission** - only single-celled organisms reproduce in this way. The cell splits into two cells and each one is identical. (**bacteria, amoeba, algae**)
- **Budding** - the parent organism produces a bud (a smaller version of itself), which eventually detaches itself from the parent and becomes a self-sufficient individual - identical to the parent. Coral also reproduces in this way, but do not detach themselves (**hydra, yeast, coral**)
- **Spore Production** - spores are similar to seeds, but are produced by the division of cells on the parent, not by the union of two cells. One parent may produce many spores, each of which will grow into a new individual, identical to its parent. (**fungi, green algae, moulds, ferns**)
- **Vegetative Reproduction** - is the reproduction of a plant not involving a seed, including; cuttings, runners, suckers, tubers. (**coleus plant, spider plants, strawberries, aspen, potatoes**)

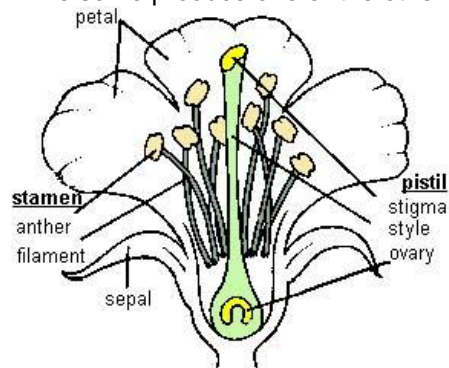
Sexual reproduction usually involves two individual organisms. The offspring that are produced from this union have a mix of characteristics, half from one parent and the other half from the other parent. Sexual reproduction does not always involve male and female parents, but can have specialized **gametes** (reproductive cells that have only one role - to join with another gamete during reproduction).

Sexual Reproduction in Animals

Sexual reproduction in animals involves gametes. The male gametes are called **sperm cells**, and the female gametes are called **egg cells** (ova). During mating, the sperm cell and the egg cell unite to form a fertilized combination of cells called a **zygote**. This zygote is the first of many cells of a new individual. This zygote will begin to divide into two cells and this continues to be repeated over and over resulting in the development of an **embryo**. This embryo develops into a multi-cellular organism inside the female (in most mammals) or, outside (in an egg shell) in other animals.

Sexual Reproduction in Plants

Sexual reproduction in plants involves gametes as well, male gametes and female gametes joining, during **fertilization**, to produce a zygote and then an embryo. Most plants produce both male and female gametes, while some produce one or the other only.



Pollen contains the male gametes and is found on the **stamen**. **Ovules** contain the female gametes and are found in the **pistil**. **Pollination** occurs when pollen is transferred from the **anther** of the **stamen** to the **stigma** of the **pistil**. **Cross-pollination** occurs when **pollen** from one plant is carried to the **stigma** of another plant by wind, water or animals (bees or butterflies). **Cross-fertilization** occurs when a grain of the pollen forms a long tube, which grows down the **style** into the **ovary**. The gametes unite to produce a **zygote**, which then develops into an **embryo**. This usually happens inside a **seed**, which protects the embryo and provides food (**cotyledon**) for the embryo when growing conditions are right. Plants which are produced, as a result of **cross-fertilization**, are not identical to either plant.

Advantages and disadvantages of Asexual and Sexual Reproduction

Sexual reproduction has the advantage of providing lots of variation within a species, helping it to survive when the environment changes. The main disadvantage is that this process takes a lot of energy. This means that they can only produce

Asexual reproduction does not require any specialized cells to produce a new plant. It can therefore produce many plants very quickly. This is an advantage in places where the environment doesn't change very much (**bacteria**). By building a large population of organisms very quickly the species is able to thrive. The great disadvantage is that when the environment changes, all of the organisms will die, if they do not have the ability to adapt to the change.

Organisms that reproduce Sexually and Asexually

Sponges are organisms that can produce both sexually and asexually. Most plants that produce seeds can also reproduce asexually (cuttings, runners). Depending on the environmental conditions the amount of energy varies, enabling the plant organism to control its population.