

Heredity And Evolution

Heredity:

Characters of parents get copied in children. Skin colour, hair colour, height, appearance, etc. in children resemble either of parents or grandparents. This phenomenon is known as heredity. Chromosomes contain genes, which work like a recording device recording all the genetic codes of an individual and transferring them to the next generation.

Variation:

As half of the chromosomes come from paternal side and rest half from maternal side, so the offspring will have a mix of characters from both parents. This mixing up of characters creates slight variation in the genetic makeup of the offspring. These variations accumulate over hundreds of years giving rise to a altogether new species.

Rules for the Inheritance of Traits –Mendel's Contributions:

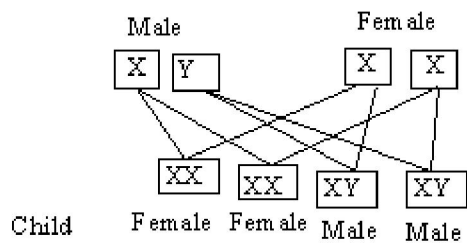
John Gregor Mendel (1856-63) conducted hybridization experiments on pea plants for many generations and studying how certain characters get transferred from one generation to the next generation. He also studied how certain characters become dormant or prominent in a particular generation. One of the experiments involved making hybrids of wrinkled seeds and smooth seeds. The results can be depicted by following diagram:

Generation	Character 1		Character 2	
Parent	Wrinkled Seed		Smooth Seed	
Gametes	W	W	S	S
F-1 Generation	WS (Wrinkled)	WS (Wrinkled)	WS (Wrinkled)	WS (Wrinkled)
F-2 Generation	WW (Wrinkled)	WS (Wrinkled)	WS (Wrinkled)	SS

Interpretation of Results: In the first generation all the seeds were wrinkled. The 'wrinkled' character was dominant, while the 'smooth character was dormant. Both characters were present in the genotype or genetic makeup. In the next generation 25% of seeds were pure wrinkled with 'wrinkled' genotype, 25% seeds were pure smooth with 'smooth' genotype and 50% of seeds were wrinkled with 'wrinkled+smooth' genotype. This shows how sometimes children of tall father can be of average height as the 'tall' character becomes dormant in that generation.

Sex Determination

This issue answers the question how it is possible that the newborn is a male or female. In some animals, like crocodile, the temperature at which an egg hatches determines the sex of a newborn. In human it depends on the last pair of chromosomes. As you know human have 23 pairs of chromosomes. 22 pairs are alike and the 23rd pair can be of similar or dissimilar chromosomes. In females both chromosomes of the 23rd pair consists of X type, while in male the 23rd pair is made up of XY chromosomes. Following diagram shows what happens when a zygote is formed:



It is clear by above diagram that when two gametes with X chromosome make zygote the offspring will be female. When one gamete with X chromosome fertilizes another gamete with Y chromosome to make zygote the offspring will be male.

EVOLUTION:

Life started on earth as simple unicellular organisms. These organisms through evolution over millions of years created hugely diverse life forms which we see today. In fact variations accumulating over a period of time created a new species and the process continued and will be continued in years to come.

Charles Robert Darwin (1809–1882) Charles Darwin set out on a voyage when he was 22 years old. The five-year voyage took him to South America and the islands off its coast. During his voyage Darwin collected huge number of specimens for his study. After analyzing all information he came up with his theory of evolution in his book 'Origin of Species'.

Origin of Life on Earth: All living beings are made up of basic elements like Carbon, Hydrogen, Oxygen and Nitrogen. In the initial period of earth's life these elements combined together to form the earliest living beings, which had the power of replicating itself.

Darwin's Theory of Evolution:

Struggle for Existence

1. Species have great fertility. They have more offspring than can grow to adulthood.
2. Populations remain roughly the same size, with small changes.
3. Food resources are limited, but are relatively stable over time.
4. An implicit struggle for survival ensues.
5. In sexually reproducing species, generally no two individuals are identical.
6. Some of these variations directly affect the ability of an individual to survive in a given environment.
7. Much of this variation is inheritable.

Natural Selection and Survival of the Fittest

8. Individuals less suited to the environment are less likely to survive and less likely to reproduce, while individuals more suited to the environment are more likely to survive and more likely to reproduce.
9. The individuals that survive are most likely to leave their inheritable traits to future generations.
10. This slowly effected process results in populations that adapt to the environment over time, and ultimately, after interminable generations, these variations accumulate to form new varieties, and ultimately, new species.

Proofs of Evolution:

- 1. Homologous organs:** Organs, like forelimbs, digestive system, of humans, birds, crocodiles and bat show same basic design. This similarity in design suggests that they have originated from same root.
- 2. Analogous organs:** Wings of bats and those of birds are different in design but serve the same purpose. The similarity in purpose indicates towards single source of their origin.
- 3. Rudimentary Organs:** Certain organs in human are having no functional value. Appendix and nictitating membrane are such examples. Appendix is reduced form of an additional chamber in the digestive system of ruminating animals like cow, where they help in cellulose digestion. Humans no longer need them so they are functionless. Nictitating membranes in frog's eyes help them to see under water. We need special goggles for that. These rudimentary organs suggest that we have evolved from frogs.
- 4. Developmental Stages in Foetus:** This theory suggests that right after the formation of zygote up to delivery an animals passes every stage of evolution through which it has evolved. In case of humans at certain stage the human embryo looks like that of a fish, later it looks like that of a frog and ultimately it develops into a human being. This is like reliving your past lives.
- 5. Fossils:** Fossils are remains of living beings which were buried millions of years ago under the earth. They provide us with linking proofs between various groups of animals.

Evolution and Classification:

Evolutionary principles has been used for classification of animals and plants. For example all animals with four legs have been included in the class tetrapoda (tetra:four; podium:Legs). All flowering plants come under angiosperms.

Main Animal Groups

Groups	Characteristic	Example
Mammalia	Mammary glands, viviparous(foetus develops inside uterus), hair on body	Man, Cow, Bat, Rat
Aves	Fore limbs are modified into wings	All birds
Amphibians	Respiration by lungs as well as through skin	Frogs, toads
Reptiles	Crawling animals,	Lizards, crocodiles
Arthropoda	Jointed legs	All insects
Mollusca	Soft body protected by shell	Snails