**UNIT I: Scope of Human Genetics**

**Human genetics** is the study of the inheritance of characteristics by children from parents. It attempts to explain similarities and dissimilarities among the related individuals. To understand the scope of Human genetics in toto, we need to expose to various overlapping fields of genetics. Thus, Human genetics is a multidisciplinary field that encompasses a variety of overlapping fields including *classical genetics, cytogenetics, molecular genetics,,*[*biochemical genetics*](https://en.wikipedia.org/wiki/Biochemical_genetics)*,*[*genomics*](https://en.wikipedia.org/wiki/Genomics)*,*[*population genetics*](https://en.wikipedia.org/wiki/Population_genetics)*,*[*developmental genetics*](https://en.wikipedia.org/wiki/Developmental_genetics)*,*[*clinical genetics*](https://en.wikipedia.org/wiki/Clinical_genetics)*,* and [*genetic counselling*](https://en.wikipedia.org/wiki/Genetic_counseling). The scope of Human genetics can be outlined in following way:

**Classical Genetics:**

Classical genetics, which remains the foundation for all other areas in genetics, is concerned primarily with the method by which genetic traits are transmitted in plants and animals. Human geneticists are concern with the study of the mechanism of the inheritance pattern of those genetic traits that are generally dominant, [recessive](https://www.britannica.com/science/recessiveness), intermediate, polygenic, sex-linked, autosomal, X-linked, Y-linked, Sex contolled, Sex-limited etc.

**Cytogenetics:**

Cytogenetic deals with the physical basis of heredity (cell). It can also be termed as the study of chromosomes, which are the visible carriers of the heredity material. In human genetics, we study the structure of cell, chromosome, gene, DNA and the various areas related with transmission of abnormal traits from one generation to the other.

**Molecular genetics**

Molecular genetics deals with the chemical basis of heredity. It is the advance field of genetics. It is the most important area of study for human geneticist. Molecular genetics allows us to understand the DNAstructure (nucleotides, DNA polynucleotides, the double helix, complementary base pairing) RNA structure and interrelation between DNA and RNA molecules. Molecular genetics has revolutionized human genetics and is having an ever increasing impact in pharmacology, genetic engineering in disease prevention, in detection of disease and crime (forensics) etc. Further it helps us in tracking DNA evolution, migratory patterns and species evolution over the ages. The advances brought in molecular geneticists have profound implications for the future of medicine for they have placed us at the threshold of new methods of diagnosis, prevention, and treatment of numerous human diseases.

**Population Genetics**

Population genetics is the study of the frequencies of alleles in a population. Human geneticists with the help of population genetics studies the origin of variation, the transmission of variants from parents to offspring generation after generation, and the temporal changes that occur in a population because of systematic and random evolutionary forces.

**Human Biochemical Genetics**

Biochemical genetics is an important branch of Human Genetics, which provides a base to understand the genetic variation and disease occurrence. Human biochemical genetics expose how the study of human systems led to advances in basic biology. Recent development in the whole human genome project has been driving force for identifying genetic disorders.

**Behavioral genetics**

Behavioral genetics is a field in which genetic methodologies from twin and adoption studies through DNA will be applied to understand the individual differences in behavioral traits. It studies the inheritance of behavioral traits. In this field emphasis will be given to understand how important are genetic and/or environment influence on certain human behavioral traits (gene environmental interaction). The science of behavioral genetics focuses to distinguish the effects of environment and genes.