Mendel's Laws of Heredity

Who was Gregor Mendel?

Gregor Mendel was an Austrian monk who is often called the "father of genetics" for his study of the inheritance of traits in pea plants.

- Between 1856 and 1863 Mendel cultivated and tested some 28,000 pea plants.
- He was the first person to predict how ***traits*** are transferred from one generation to the next.
- He studied only one trait at a time to control variables, analyzed data mathematically.

Important Genetics Terminology

heredity - the passing on of characteristics from parents to offspring

genetics - the branch of biology that deals with heredity

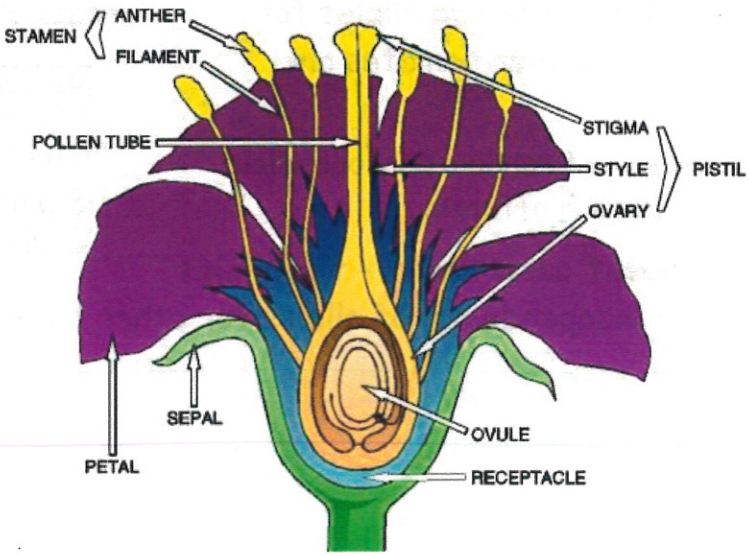
traits - a genetically determined characteristic or condition

gametes - sex cells; a reproductive cell having the haploid *(half the normal)* number of chromosomes

- female gamete (♀) - ***egg***, ***haploid or n*** *(1/2 the normal number of chromosomes, 23 in humans)*
- male gamete (♂) - s***perm***, ***haploid or n*** (1/2 the normal number of chromosomes, 23 in humans)

fertilization - the uniting of ♀ and ♂ gametes

pollination - in anthophytes *(flowering plants)*, the process of transfer of pollen grains from the ***anther*** (♂) to the ***stigma*** (♀)



Mendel's Monohybrid Crosses

What is a monohybrid cross?

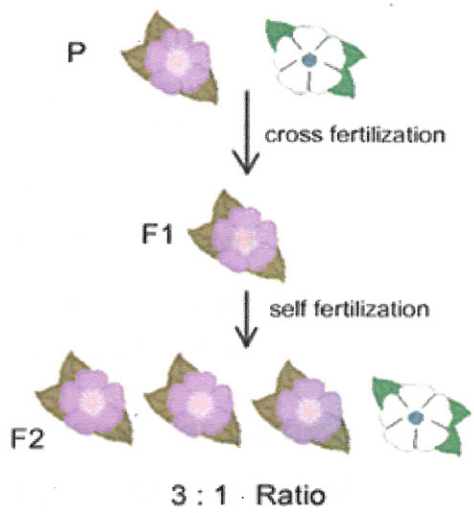
It is a cross between two genetically identical individuals.

Mendel crossed:
purple flowered plant x white flowered plant — original parents or P_1

he got:
all purple flowered plants — first offspring or F_1 (F stands for ***filial***, son or daughter)

next he crossed:
F_1 (purple flowers) X F_1 (purple flowers) — F_1

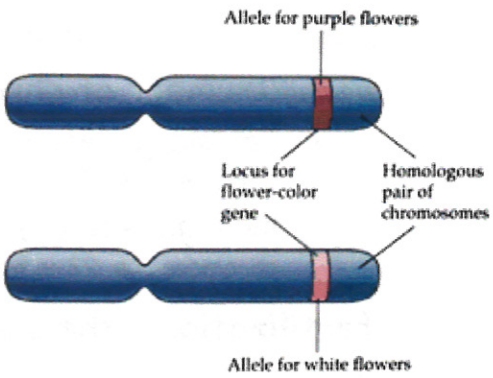
he got:
3 purple flowered plants: **1** white flowered plant — second offspring or F_2



What are Mendel's four "Rules or Laws"?

The rule of unit factor - each organism has two factors for each of its traits

- We now know these factors are ***genes*** located on the ***chromosomes.***
- These different gene forms are called ***alleles.***
- *Alleles* are located in different copies of a chromosome; one from ♂ parent, one from ♀ parent.



The rule of dominance - only one trait was visible in the F_1 generation, the ***dominant*** trait

- The ***dominant*** trait is the visible or observable trait.
- The ***recessive*** trait is the hidden trait, masked by the dominant trait.

The law of segregation - the two alleles for each trait must separate when gametes are formed

- A parent passes on at random only one allele for each trait to each offspring

Cross: Pp x Pp

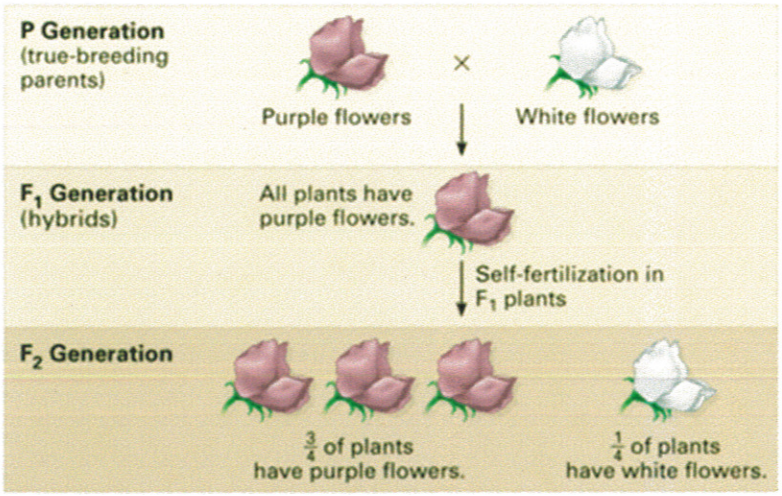
Female Gametes \ Male Gametes	P	p
P	PP	Pp
p	Pp	pp

Phenotypes:
3 purple (P_)
1 white (pp)

Genotypes:
1 PP :2 Pp :1 pp

The law of independent assortment - the alleles for one trait behave independently of alleles for other trait during gamete production

	Flower color	Flower position	Seed color	Seed shape	Pod shape	Pod color	Stem length
P	Purple × White	Axial × Terminal	Yellow × Green	Round × Wrinkled	Inflated × Constricted	Green × Yellow	Tall × Dwarf
F_1	Purple	Axial	Yellow	Round	Inflated	Green	Tall



	Seed shape	Seed color	Flower color	Flower position	Pod color	Pod shape	Plant height
Dominant trait	round	yellow	purple	axial (side)	green	inflated	tall
Recessive trait	wrinkled	green	white	terminal (tips)	yellow	constricted	short