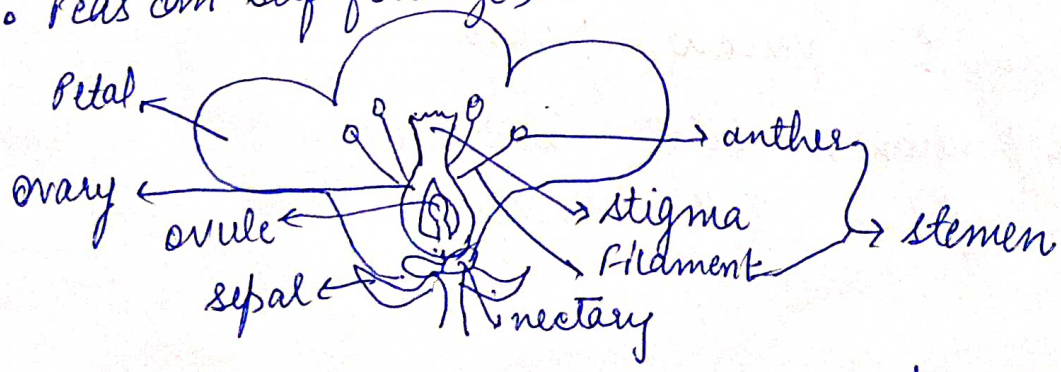
INHERITANCE IN LIFE.

Heredity: Heredity is the transmission of particulars characteristics from parent to offsprings.

Mendel presented completely new theory of inheritance in the journal "Transactions of the Natural History society of Brunn".
His work was rediscovered in 1900,
Mendel is refered as the 'father of Genetics'
His experiments and principles collectively form "Mendelian Genetics".

Mendelian Genetics (1822-1882)

- Studied garden peas
- 1st to use maths to examine outcomes of crosses
- Pea varieties with at least 7 easily distinguished traits
- Peas are small, easy to grow, short generation time.
- Peas can self fertilize; bisexual



- Peas don't take up that much space in the monastery garden
- Fertilizing organs are enclosed in a kind of closed keel
- They self fertilize. And there is no risk that pollen from some other plant is going to get in there.
- You can open it up and pollen in
- It's an ideal plant for doing genetics because we don't randomly

get much cross pollination.
- more varieties are available.

(1) selection of distinctive characters (tall x dwarf, round x wrinkled green x yellow etc)
(2) selection of true breeding varities (that would show the same characters in the same way in the offspring in succeeding generations)
(3) controlled fertilization

Seed shape: Round Wrinkled
Seed color: Yellow Green
Flower color: Purple white
Pod shape: Inflated Constricted
Pod color: yellow green
Flower position: Axial Terminal
Stem height: Tall Dwarf

Monohybrid Cross

(Pure breeds) → selective experiment → allowed HW 7.

- In Monohybrid cross Mendel selected one character for his experiment
- crosses were made between white flowered and purple flowered plants
- Pollens from the purple flowers were placed onto the stigma of white flowers.
- Allowed it to cross fertilization
- All the seeds in the pod resulted from this pollination were hybrids.

Purple × white

↓

1st Generation → Purple color offsprings (white missing)

× Purple (again with purple)

↓

2nd Generation → Purple and white offsprings

3 : 1.

[Purple → Dominant
white → recessive]

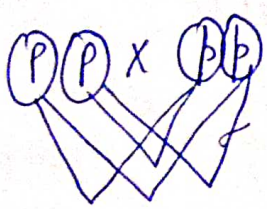
[appeared in 2nd but less ratio of white]

~~Purple~~ ← PP × pp → ~~white~~

(Homozygus condition)

Dominant → Big letter

Recessive → small letter



Pp Pp Pp Pp

one dominant one recessive

PP, pp → two characters beg of Two set of chromosomes M & F

Humans has 46 chromosomes

(23) (23)

↓ ↓

M F

Punnet's Square

F_1

	P	P
p	Pp	Pp
p	Pp	Pp

→ one dominant alleles
→ one recessive alleles

Since P is dominant, therefore no white colour.

F_2

Homo	P	p
P	PP → purple	Pp → Hetero → purple
p	Pp → purple	pp → Homozygous → white

→ 3 : 1 → [By appearance] [Phenotypic ratio]
color

→ with respect to Genotype
2 Hetero and 1 Homo in purple and 1 homo in white
→ 1 : 2 : 1

Observation and Interpretation of monohybrid cross

(1) The hybrid of offspring always resembled one of the parent, did not have an intermediate color.
(2) The first filial generation plants had all purple flowers
(3) Mendel referred to the trait expressed in the F_1 plants as dominant and to the alternative trait, which was not expressed in the F_1 as recessive.
(4) The plants obtained from self pollination of F_1 generation exhibited the recessive trait { second filial F_2 generation }
(5) Mendel counted the numbers of each type amongst the F_2 progeny Amongst the 929 total F_2 individual. 705 had purple flower and 224 had white flowers.

→ The genotype ratio 1:2:1 is the really distinguished with true breeding dominant, not true breeding and one quarter true breeding.

↳ 3/4th of the F_2 individuals exhibited the dominant trait and 1/4th displayed the recessive trait. The ratio of dominant to recessive among the F_2 plants was always 3:1

→ The study of F_2 plants in later generation he found that one quarter that were recessive were always true breeding. where

→ 2/3rd of the dominant F_2 were true breeding.

→ For each pair of traits that Mendel examined, one alternative was not expressed in the F_1 hybrids although it reappeared in the F_2.

→ In the pairs of alternative traits one trait must have been latent in the F_1 generation.

→ He concluded that the traits segregate among the progeny of a particular cross, and some plants express one trait some exhibit other.

Law of Seggregation

Whenever a pair of 'factors' for character brought together in a hybrid, they segregate during the formation of gametes. Hence each gamete is pure with reference to this character.

—— END OF MONHYBRID CROSS ——

BACK CROSS - TEST CROSS (crossed F_1 with parents) ↙D ↘R

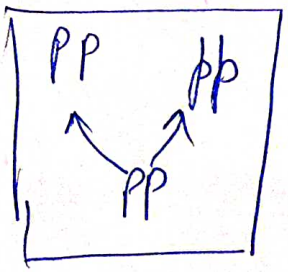
- A cross involving F_1 individuals with either of the two parents is called back cross.
- A back cross between the F-1 hybrid and dominant parental type will produces only dominant individuals.
- The cross between F1 and recessive parents type both the phenotypes appear in the progeny 50:50%. The cross between F1 and recessive parents is called test cross (Pp X pp).

(First Gen with parent) Pp X PP

(~~Dominant parent~~)

	P	p
P	PP	Pp
p	PP ↙ Homo	Pp → Hetero

Phenotypic → All purple colours
genotype → Cannot be found



(~~Recessive parent~~) Pp X pp

	p	p
P	Pp	Pp → 2 purple, 2 white
p	pp	pp

Phenotypic ratio → 1:1
genotypic → 1:1
2 Hetero, 2 homo.

To find genotype → always cross with recessive breed.
1:1 - hetero
see dominant → pure breed.

Mendel proposed a simple model of heredity - (5 parts):

(1) Parents transmit factors to offspring

(2) Each individual receives 2 factors which code for the same trait.

(3) Not all factors are identical. - alternative gene forms are called alleles

(4) Alleles do not influence each other as alleles seperate. independently into gametes.

(5) The presence of an ~~allele~~ allele does not insure that the trait will be expressed.

Terminology:

Monohybrid : 1 character was carried along.
Dihybrid : 2 characters.

Genotype : Gene form (Dominant or recessive)
Phenotype : Physical appearance.
Alleles : Individual factors responsible for character
Dominant : which gets readily expressed in the new generation
Recessive : wont get really expressed, requires one more same type of allele

Homozygous : Both alleles are same.
Heterozygous : different type of alleles.
Haploid : 1 factor (set) is given during gamete formation
Diploid : 2n → during gamete formation.

Genotype : total set of alleles of an individual.

PP = homozygous dominant

Pp = heterozygous

pp = homozygous recessive

Phenotype : outward appearance of an individual

In a homozygote (SS), the probability of producing a S gamete is 1
In a heterozygote (Ss), the probability of producing a S gamete is ½ and s gamete is also ½

Now consider the F_2 generation. The probable gametes here are S and s

Hence the probability of getting SS is ½ X ½ = ¼ = 25% are homozygous dominant.

The probability of getting ss is ½ X ½ = ¼ ie 25% are homozygous recessive.

Adding probabilities: What is the probability of getting Ss and sS ?

Probability of Ss (S from sperm and s from egg) = ½ x ½ = ¼

Probability of sS (s from sperm and S from egg) = ½ x ½ = ¼

Both Ss and sS are heterozygotes and will have the same phenotype. Hence added probability is ¼ + ¼ = ½ i.e 50% will be heterozygotes.