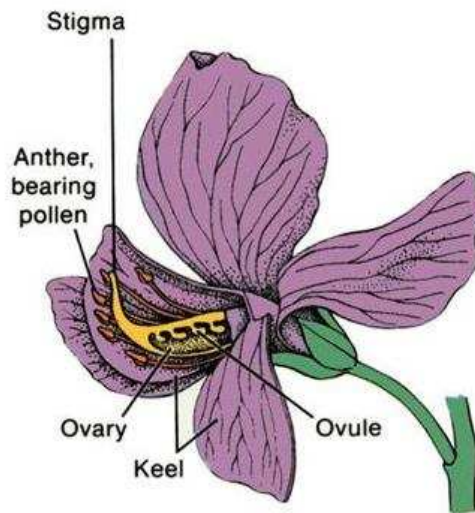


INTRODUCTION TO GENETICS

Genetics - the study of biological inheritance or
Heredity – passing of traits from parents to offspring
1800s Gregor Mendel studied the pea plant long before chromosomes and meiosis were known. Pea plants are **self-pollinating** fertilization is carried on in a single plant, resulting in **purebred** plants that had only one type of trait.



Mendel learned how to **cross-pollinate** - pollinate one plant with the pollen from another.

Mendel studied 7 traits – which were on ***seven different chromosomes!***

He started by crossing plants with different characteristic for the same trait =

green seeds or yellow seeds
tall or short

He then looked for a “blending” of characters =

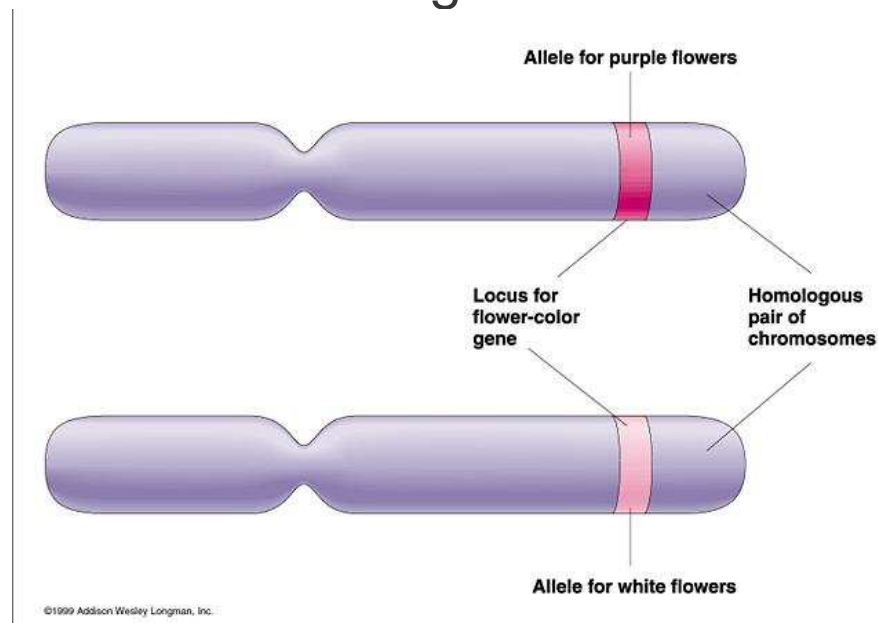
green, yellow, yellowish-green
tall, short & medium

Instead, he got all offspring with only one trait – the other trait was gone!

all plants were tall or
all peas were yellow

Genes units of hereditary information or factors that control traits found on chromosomes.

Alleles a type of gene or either member of a pair of genes that determine a single trait.



Mendel found that one allele was **Dominant** – a trait that is seen whether or not a **Recessive** allele was present.

His ***purebred*** tall plants all had the dominant tall allele on both homologous chromosomes.

Short plants had short alleles on both chromosomes.

Alleles are named by using the first letter of a dominant trait, capital letter for dominant, lower case letter for recessive =

T for tall, **t** for short

Y for yellow, **y** for green

Genotype – the pairs of alleles in the cells of an organism **TT, Tt, tt**

Phenotype – an expressed trait – what the organism looks like **tall, short, yellow, green**

Homozygous dominant -
two dominant alleles **TT, YY**

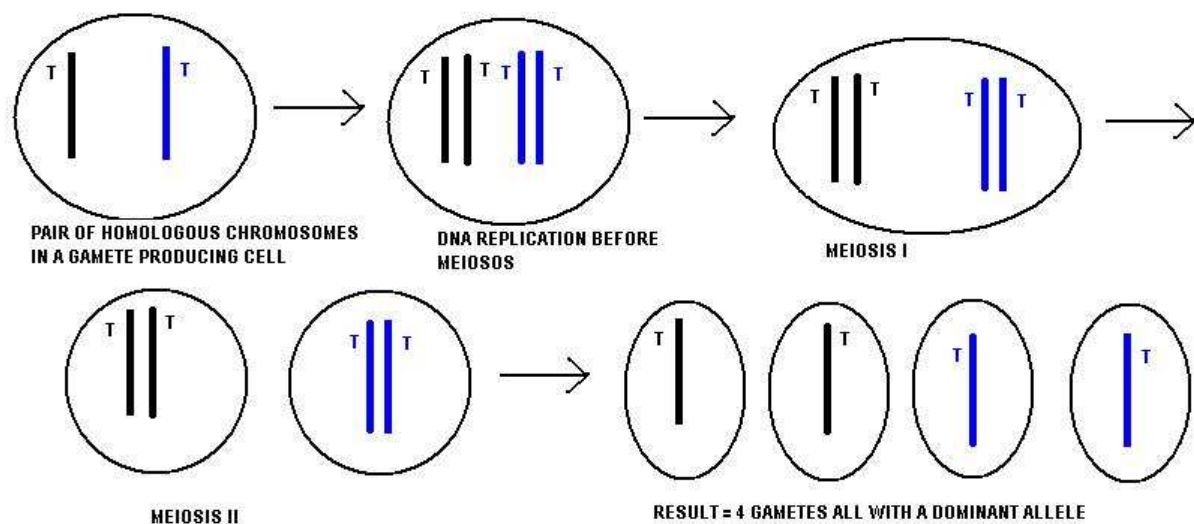
Homozygous recessive –
two recessive alleles **tt, yy**

Heterozygous –
one dominant and one recessive allele **Tt, Yy**

Gametes are produced by meiosis

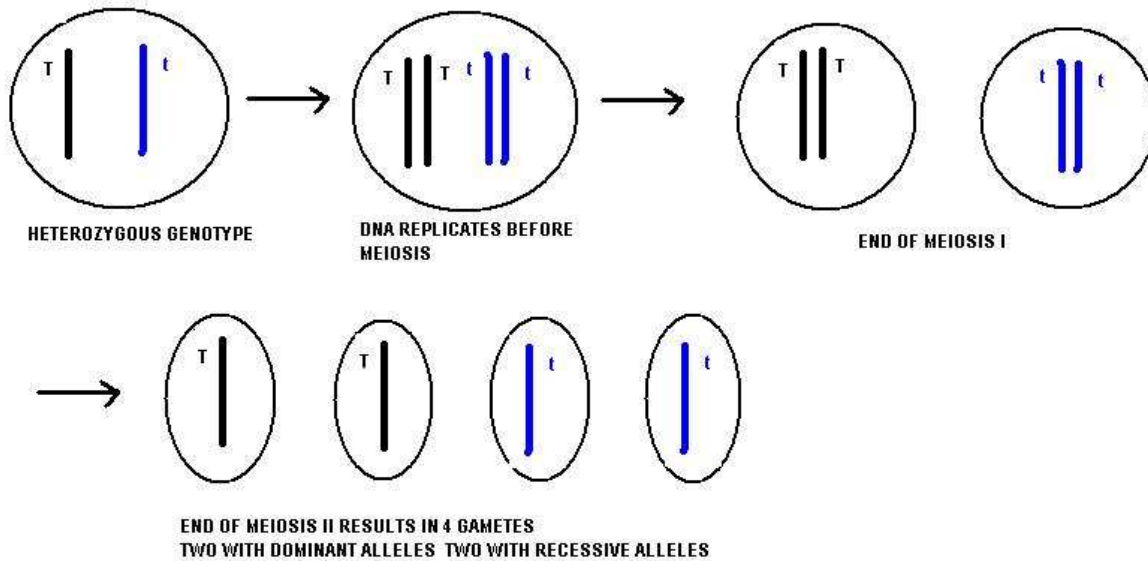
TT genotype will produce only **T** gametes

tt genotype will produce only **t** gametes

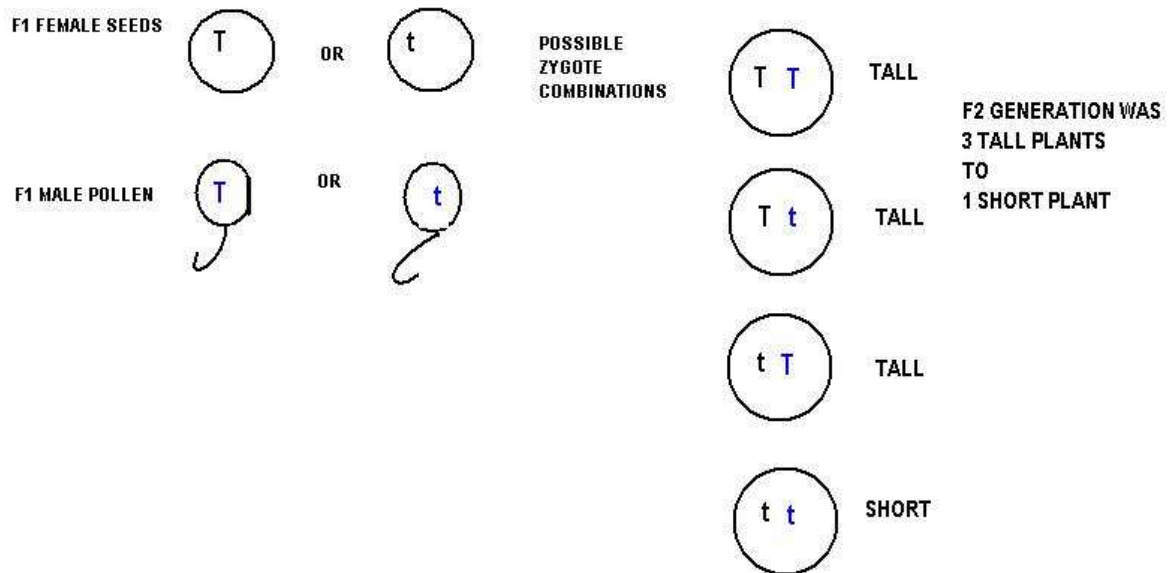


Mendel's purebred Parent generations gave only one type of gamete. When he crossed tall (which gave only the **T** allele) with a short (which gave only a **t** allele) all of the offspring – the **F₁ generation** were all **Tt Heterozygous** all tall plants.

Tt will produce 2 **T** gametes and 2 **t** gametes



When Mendel crossed two **F₁** plants genotype **Tt** - what were the possible **zygote (fertilized egg)** combinations?



F₂ Generation was 3 tall plants to 1 short plant

TT phenotype = tall

genotype = **homozygous dominant**

Tt phenotype = tall

genotype = **heterozygous**

tt phenotype = short
genotype = homozygous recessive

Homozygous are **Purebred**

Heterozygous are **Hybrid**

Additional information:

Codominance – heterozygous genotype in which both phenotypes are expressed:

Parents = Red bull genotype $C^R C^R$
White cow genotype $C^W C^W$

F₁ Generation = Roan (red & white hairs)
genotype $C^R C^W$

Incomplete Dominance – heterozygous genotype in which a third phenotype is expressed:

Parents = Red Flowers genotype RR
White Flowers genotype rr

F₁ Generation = Purple flowers genotype Rr

Polygenic – phenotype or trait controlled by many genes.

Example: in humans = hair, skin, and eye color