Patterns of inheritance and principles of heredity. Monohybrid crossing. The first law of Mendel.

JBL-711F
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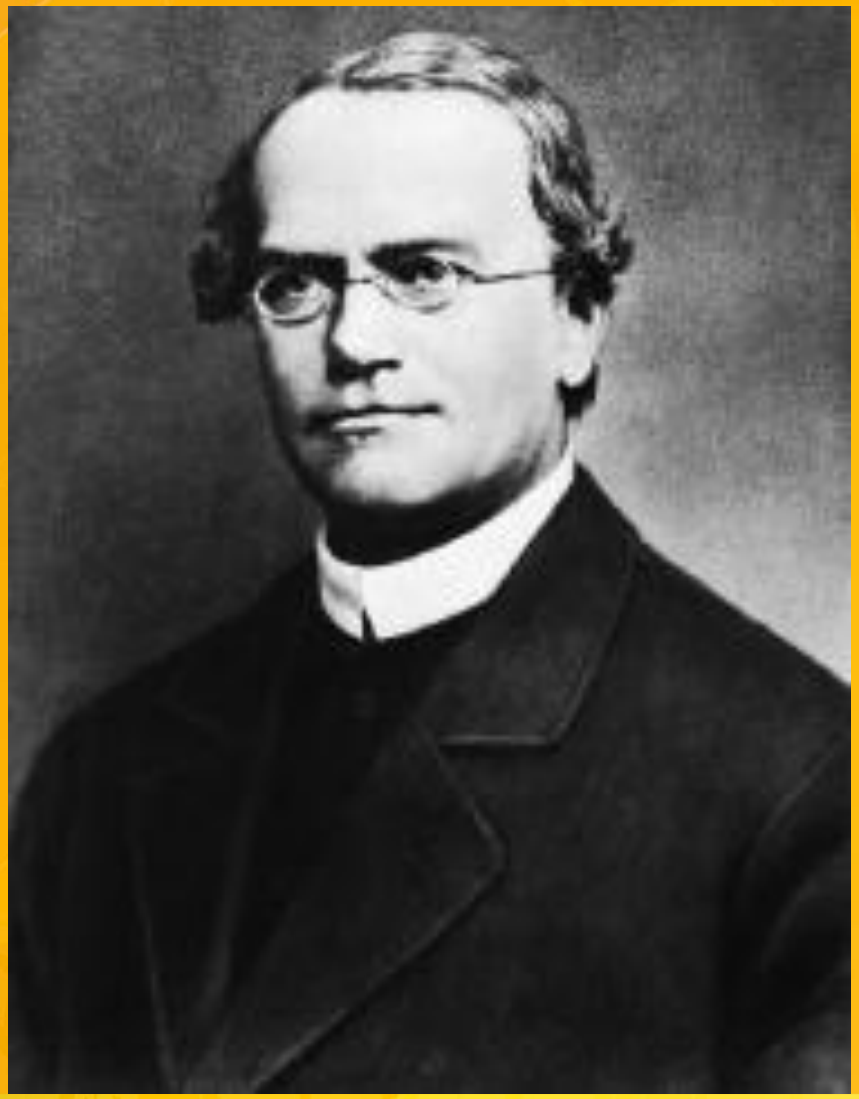
Gregor Johann Mendel

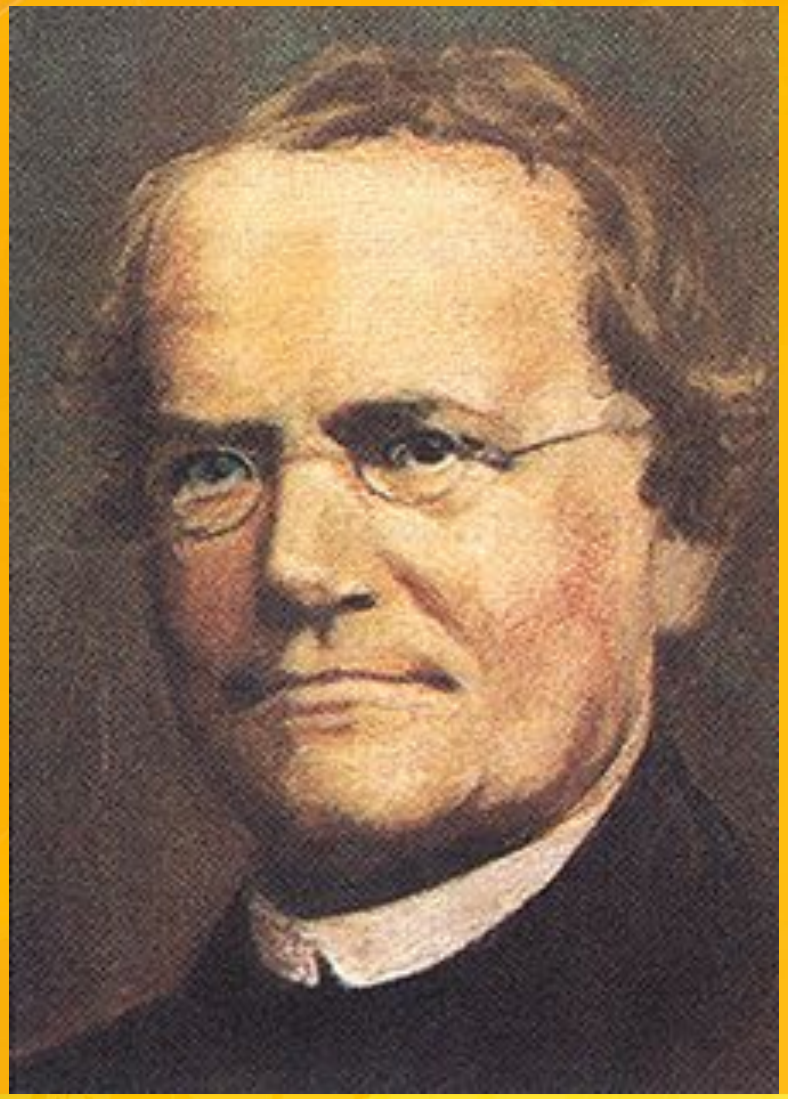
- Austrian monk
- Studied the inheritance of traits in pea plants.
- Developed the laws of inheritance.



Gregor Johann Mendel

- Between 1856 and 1863, Mendel cultivated and tested some 28,000 pea plants.

- He found that the plants' offspring retained traits of the parents.



Genetic Terminology

- **Trait** - any characteristic that can be passed from parent to offspring.

- **Heredity** - passing of traits from parent to offspring.

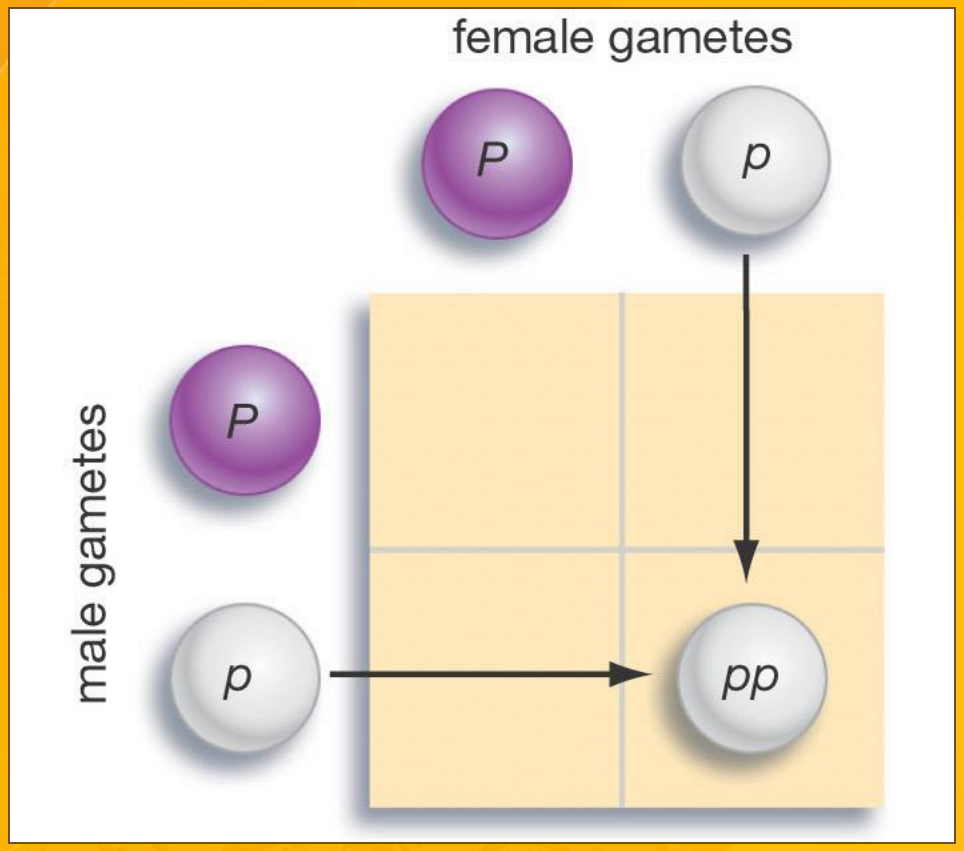
Types of Genetic Crosses

Monohybrid cross - cross involving a single trait
e.g. flower color.

Dihybrid cross - cross involving

Punnett Square

Used to help solve genetics problems



Designers - "Genes"

- **Alleles** - two forms of a **gene** (dominant & recessive).

- **Dominant** - stronger of two genes expressed in the hybrid; represented by a **capital letter (R).**

- **Genotype** - gene combination for a trait. (e.g. RR, Rr, r

- **Phenotype** - the physical feature resulting from a

Genotype & Phenotype in Flowers

Genotype of alleles:
R = red flower
r = yellow flower

All genes occur in pairs, so 2 alleles affect a characteristic

Possible combinations are:

Genotypes	RR	Rr	rr
Phenotypes	RED	RED	YELLOW

Genotypes

- **Homozygous** genotype - gene combination involving 2 dominant or 2 recessive genes **(e.g. RR or rr);** also called **pure.**

- **Heterozygous** genotype - gene

Monohybrid Crosses

P_1 Monohybrid Cross

Trait: Seed Shape

Alleles: R – Round r – Wrinkled

Cross: Round seeds x Wrinkled seeds

RR x rr

	r	r
R	Rr	Rr
R	Rr	Rr

Genotype: Rr

Phenotype: Round

Genotypic Ratio: All alike

Phenotypic Ratio: All alike

P_1 Monohybrid Cross Review

- Homozygous dominant x Homozygous recessive
- Offspring all Heterozygous (hybrids)
- Offspring called F_1 generation

F_1 Monohybrid Cross

Trait: Seed Shape

Alleles: R – Round r – Wrinkled

Cross: Round seeds x Round seeds

Rr x Rr

	R	r
R	RR	Rr
r	Rr	rr

Genotype: RR, Rr, rr

Phenotype: Round & wrinkled

Gen. Ratio: 1:2:1

Phen. Ratio: 3:1

F_1 Monohybrid Cross Review

- Heterozygous x heterozygous

- Offspring:

  25% Homozygous dominant **RR**
  50% Heterozygous **Rr**
  25% Homozygous Recessive **rr**

What Do the Peas Look Like?

Mendel's 1st Law

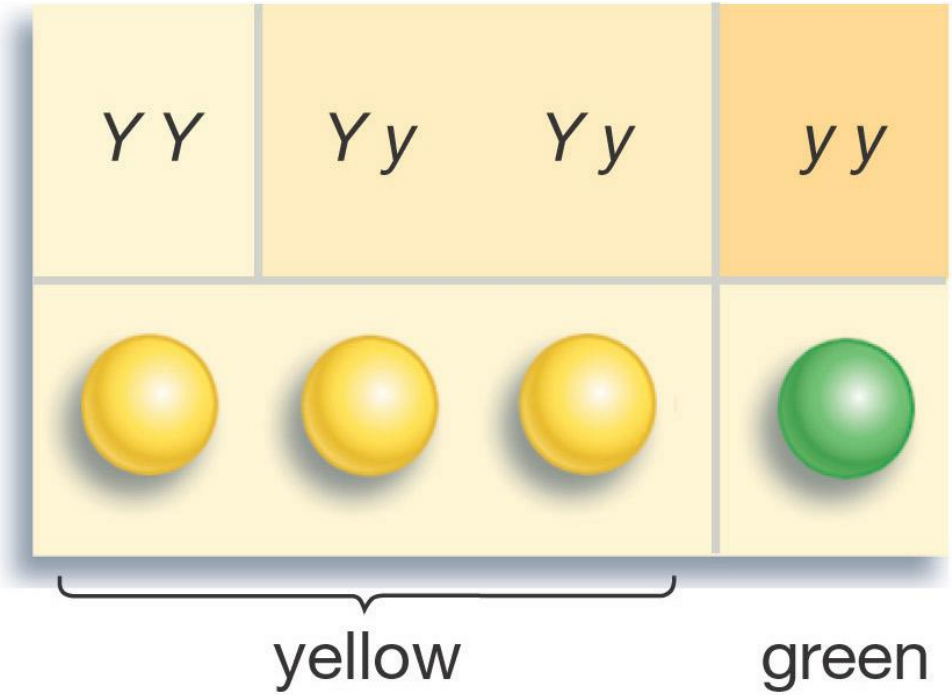
Law of Dominance

In a cross of parents that are **pure for contrasting traits**, only one form of the trait will appear in the next generation.

All the offspring will be heterozygous and express only the **dominant trait.**

RR x rr yields all Rr (round seeds)

Law of Dominance



Three genotypes yield . . .

two phenotypes.

Female Carriers

In a sex-linked trait (like hemophilia), women are carriers, and men have the phenotype more often.

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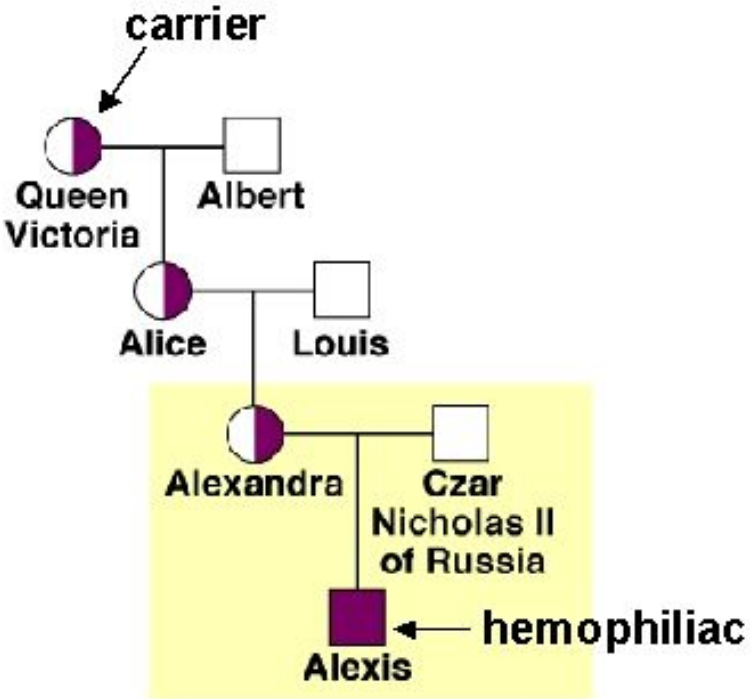
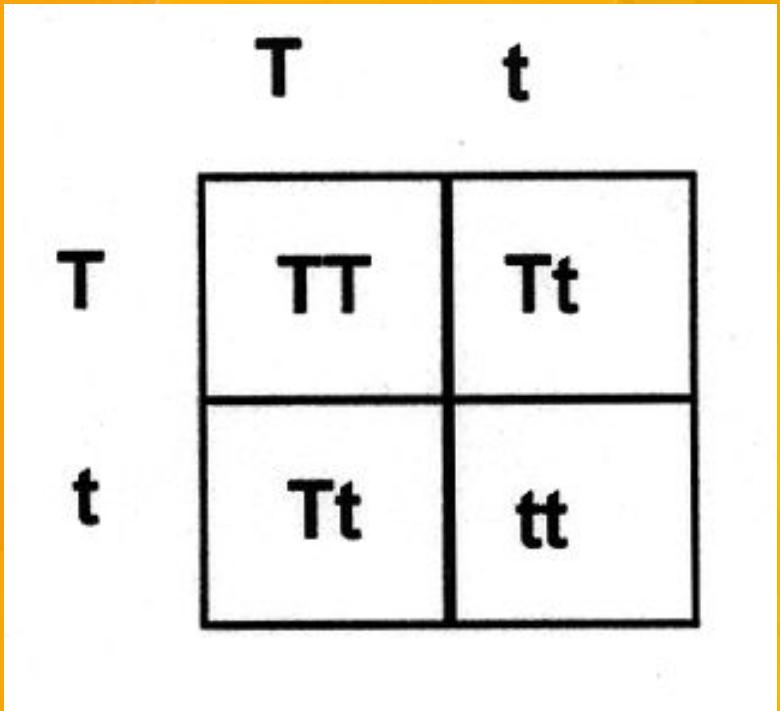
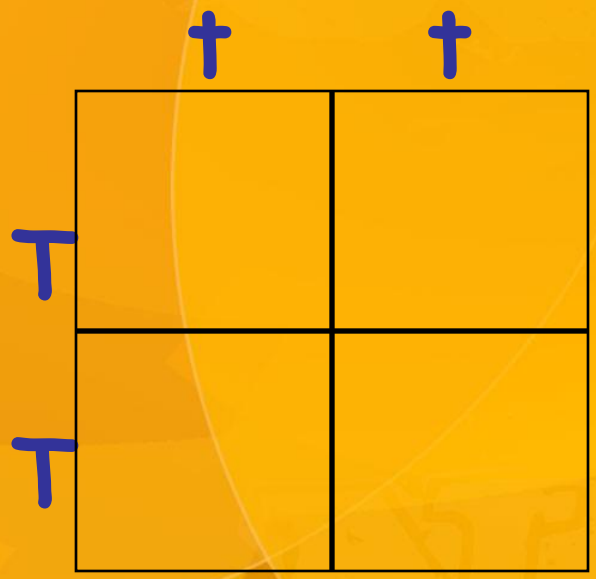


Genetic Practice Problems



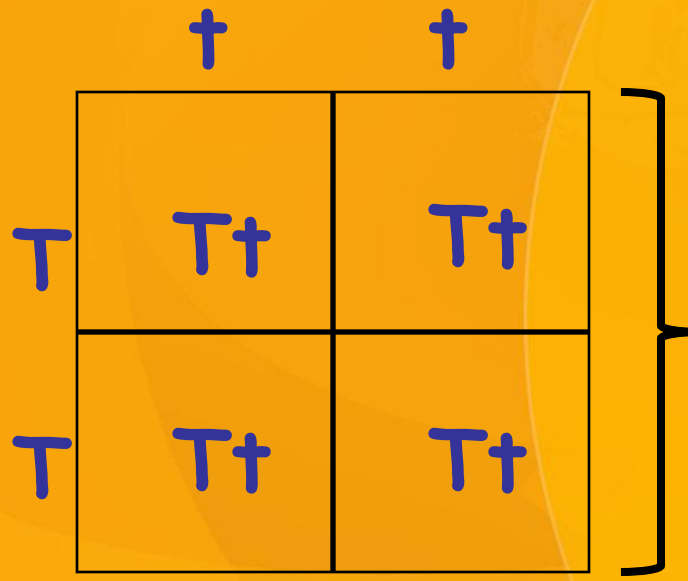
Breed the P_1 generation

tall (TT) x dwarf (tt) pea plants



Solution:

tall (TT) vs. dwarf (tt) pea plants

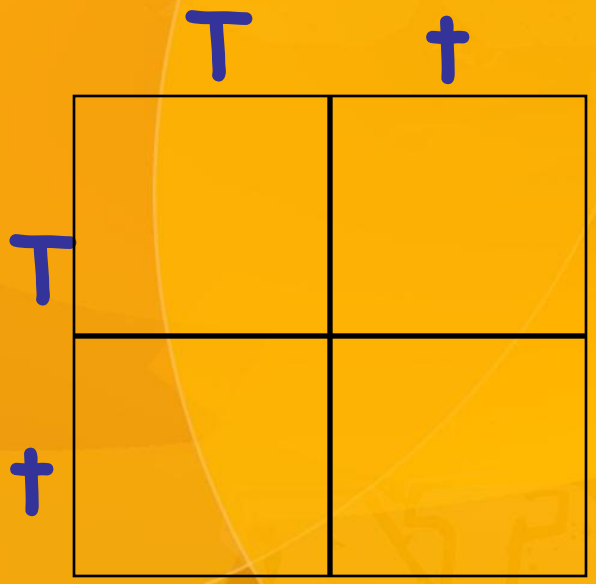


produces the F_1 generation

All Tt = tall (heterozygous tall)

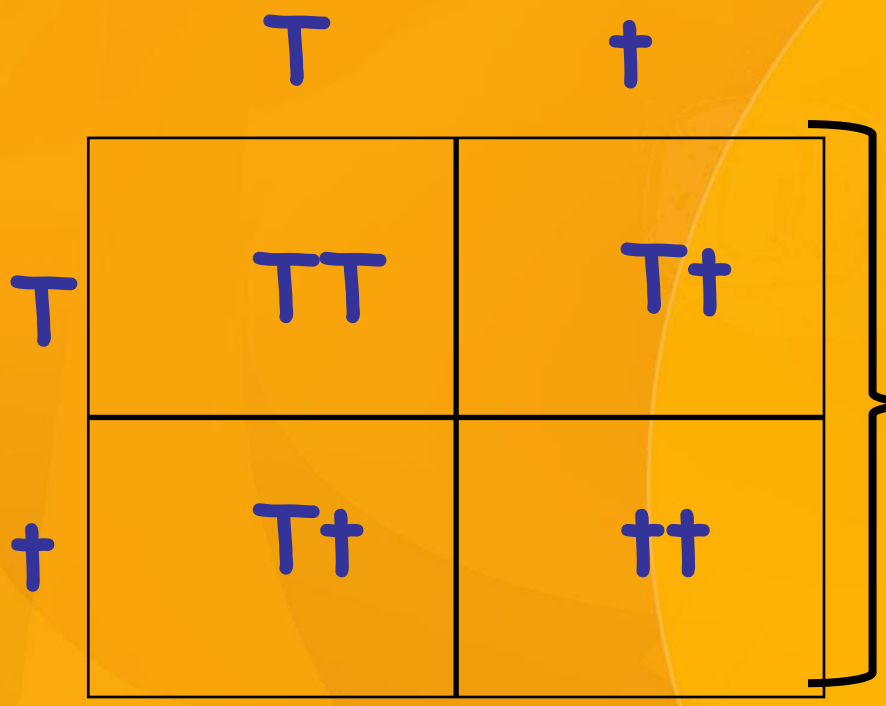
Breed the F_1 generation

tall (Tt) vs. tall (Tt) pea plants



Solution:

tall (Tt) x tall (Tt) pea plants



produces the F_2 generation

~~1/4 (25%) = TT~~

1/2 (50%) = Tt

1/4 (25%) = tt

1:2:1 genotype

3:1 phenotype

Thank you friends