Unit 5 - Mendelian Genetics

Introduction to Genetics

Essential Questions

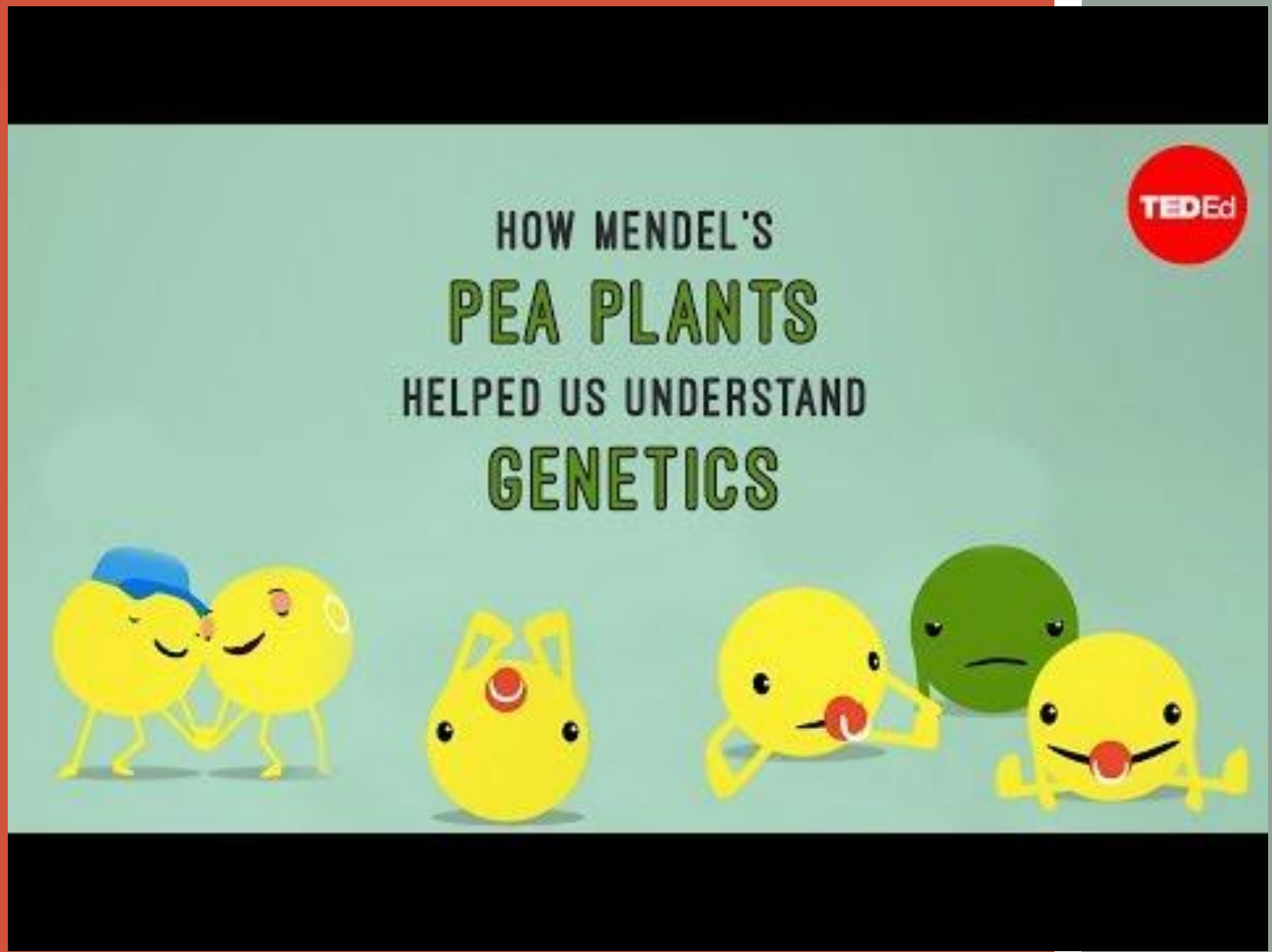
- How does genotype affect phenotype?
- What are the laws of genetics?

Learning Target

Target - We will learn how Punnett squares display chances of specific genetic inheritance.

Success - We will use Punnett squares to correctly answer specific questions about genetic inheritance.

Who Was Gregor Mendel?



Who Was Gregor Mendel?

- Known as the “father of genetics”
- Discovered how traits were inherited

Genetics: study of genes

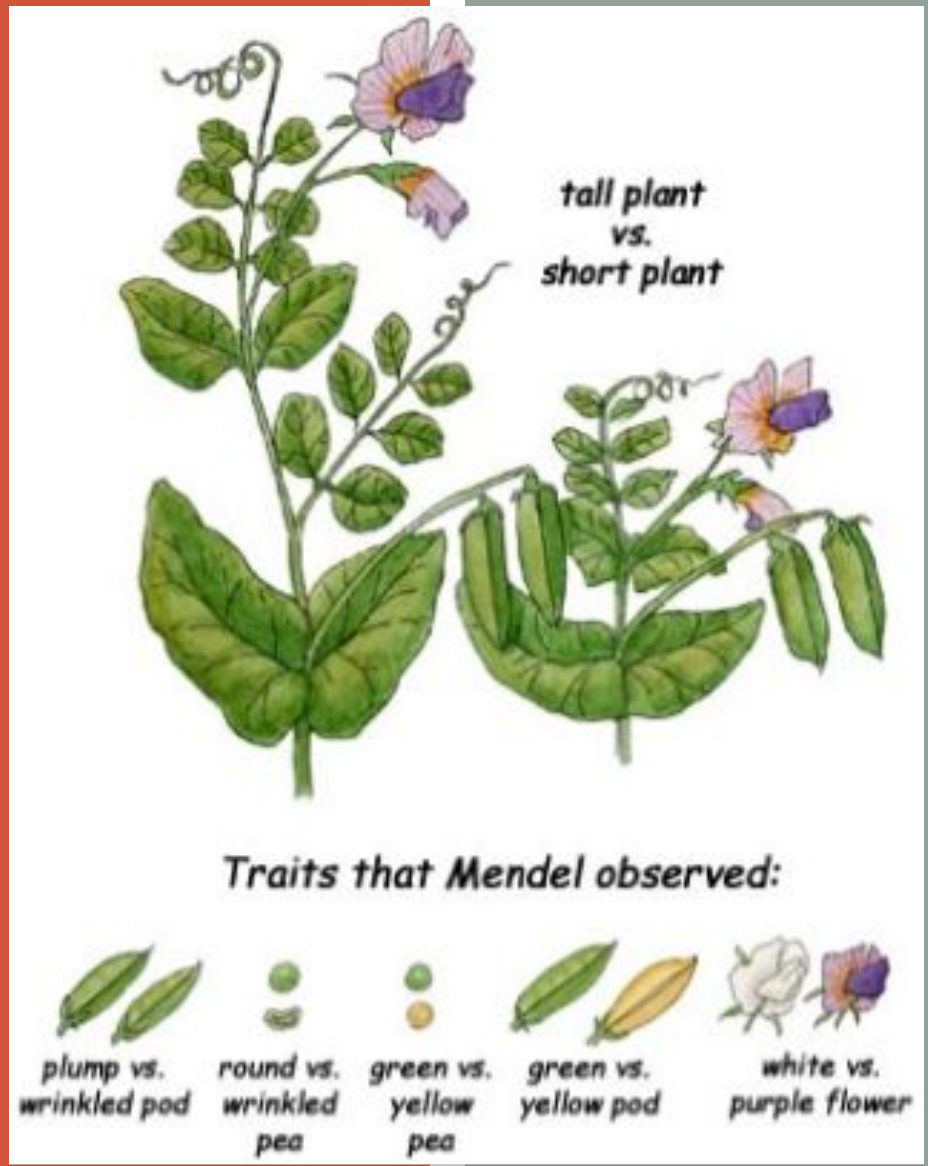
Heredity: study of traits passed from generation to generation

- A.k.a. **Inheritance**

Gregor Mendel

Gregor Mendel

- Studied traits of pea plants
  - Why?
    - Grow quickly
    - Structures easy to see
    - Clear dominant and recessive traits



Types of Traits

Dominant: takes over, always seen

- Shown with a capital letter
  - Ex.: B = brown eyes, T = tall

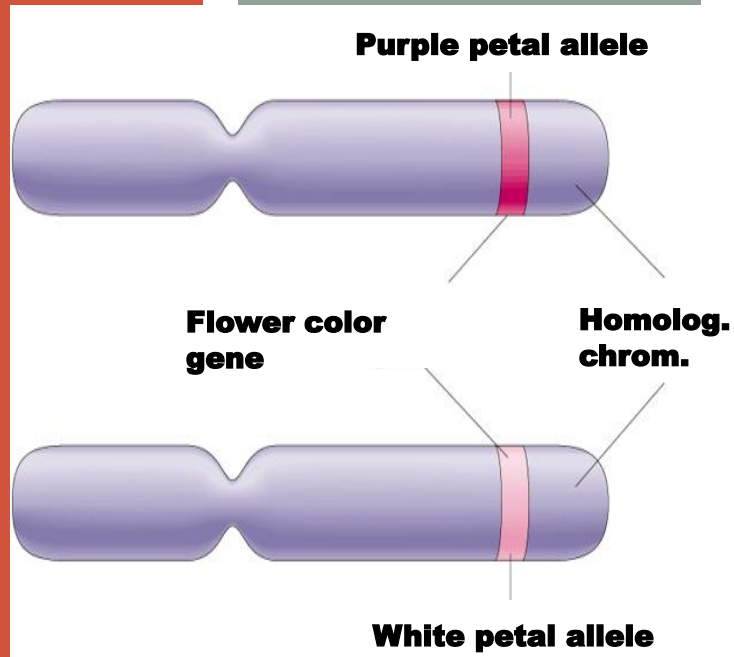
Recessive: hidden when dominant is present

- Shown with a lower-case letter
  - Ex.: b = blue eyes, t = short

Genetic Vocab

Gene: DNA segment for 1 trait

- Ex.: eye color
- **Allele:** specific form of gene
  - Ex.: B or b for eyes

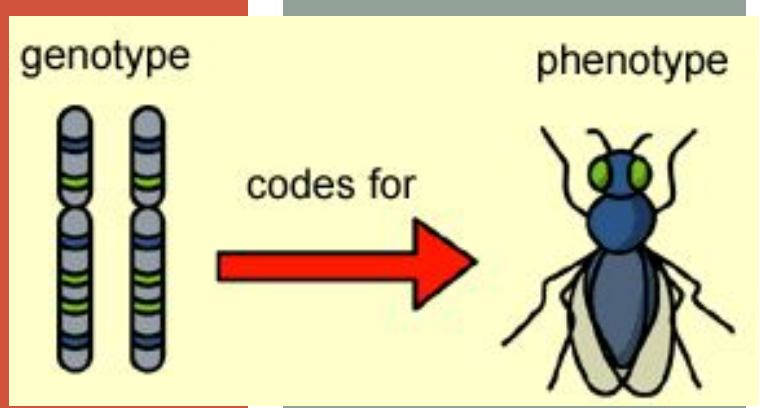


Genotype: genetic make-up for trait

- 2 alleles (1 from mom, 1 from dad)
  - Ex.: BB, Bb, bb
- Codes for **phenotype**

Phenotype: physical appearance

- Ex.: brown or blue eyes



GENOTYPES

Homozygous: same alleles from parents

- Ex.: BB, bb
- **Purebred** for that trait

Heterozygous: different alleles from parents

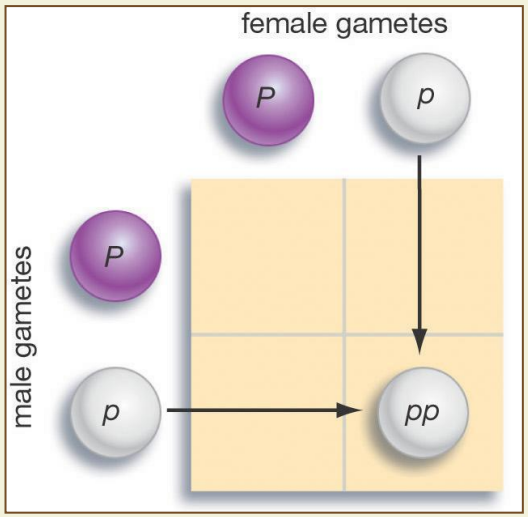
- Ex.: Bb
- **Hybrid** for that trait

PUNNETT SQUARE (DON'T WRITE)

Punnett Square: Used to find offsprings' genotypes.

1. Draw a square divided into 4 equal parts.
2. Use the letter of the dominant trait. (ex: freckles = F)
3. Place parents' alleles on top and left.
4. Fill in alleles to predict offspring.

	F	f
F	FF	Ff
f	Ff	ff



-Whole square = 100%

-1 part = 25%

-Can determine genotype & phenotype ratios

Mendel's Experiment

Chose 1 trait to investigate: height.

Each parent was purebred (1 tall & 1 short). This was his **Parent generation (P generation).**

Tall genotype = T T

Short genotype = t t

Results: genotype = T t

phenotype = tall

genotype ratio = 0 : 4 : 0

TT Tt tt

	T	T
t	Tt	Tt
t	Tt	Tt

This created the **1st Filial generation (F_1 generation).**

Mendel's Experiment cont.

Mendel wondered: does "short" disappear for good?

So, he took 2 of the F_1 generation & crossed them to create the **2nd Filial generation (F_2 generation)**.

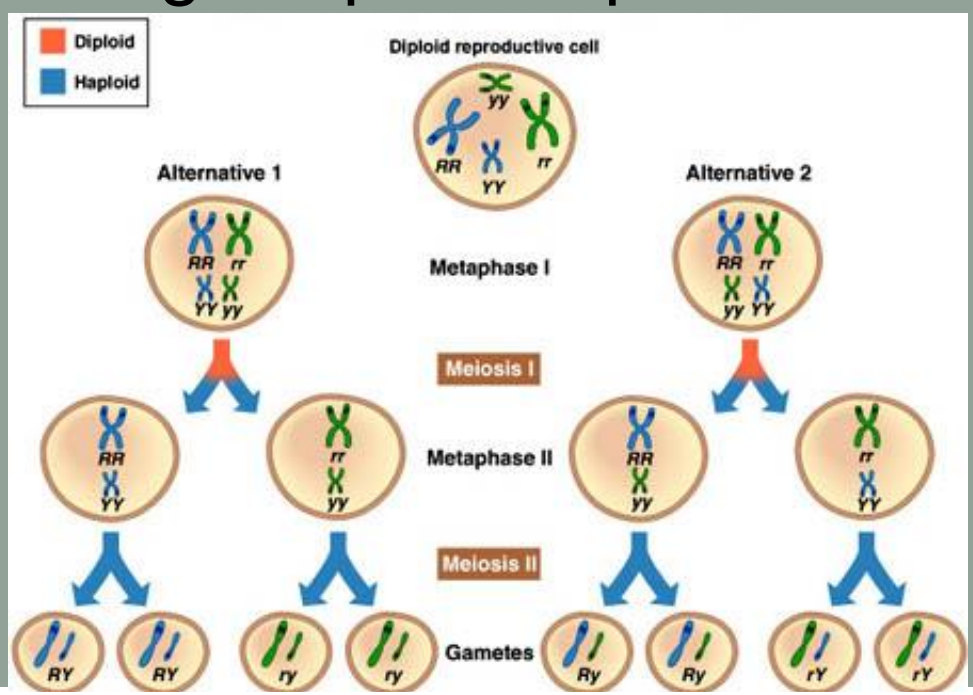
	T	t
T	TT	Tt
t	Tt	tt

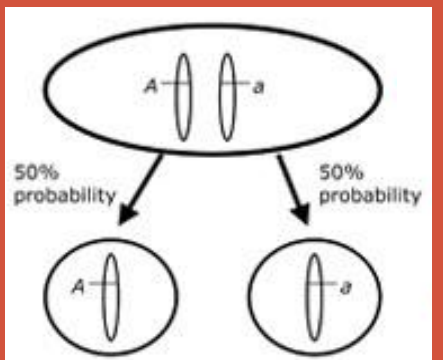
Results: genotype ratio = 1 (TT) : 2 (Tt) : 1 (tt)

phenotype ratio = 3 (tall) : 1 (short)

Mendel's 3 Laws of Genetics

1. **Law of Dominance:** 1 allele can be dominant over the recessive.
2. **Law of Segregation:** in meiosis, pairs of genes (homologous pairs) separate.
3. **Law of Independent Assortment:** in meiosis, homologous pairs separate <u>randomly</u>.





Optional Practice

1. A 1-eyed purple people eater is crossed with a 2-eyed purple people eater. All of their offspring have 2 eyes. Which trait is dominant? Two eyes

2. If you use E for this gene, what is the genotype of the offspring? (assume the 2-eyed was homozygous) Ee

3. If you crossed the offspring with each other, how many of the new offspring would you expect to have 2 eyes? ¾ or 75%