

# Introduction to Genetics

## A Brief History

In the past, people did not understand how traits were inherited, but there were many guesses based on things that could be observed.

Two theories emerged....

Blending Theory - offspring are a straight mix

Particulate Theory - traits are inherited as "particles", offspring receive a "piece" from each parent, some pieces may hide the others



Golden Doodle

# Who was Gregor Mendel?

He was known as the “FATHER OF GENETICS”

He discovered how traits were inherited

**GENETICS** – study of heredity

**HEREDITY** – the passing of traits from parents to offspring



# Mendel's Peas

Mendel did his study on pea plants which have many traits

tall/short

purple /white flowers

round/wrinkled seed

green or yellow peas

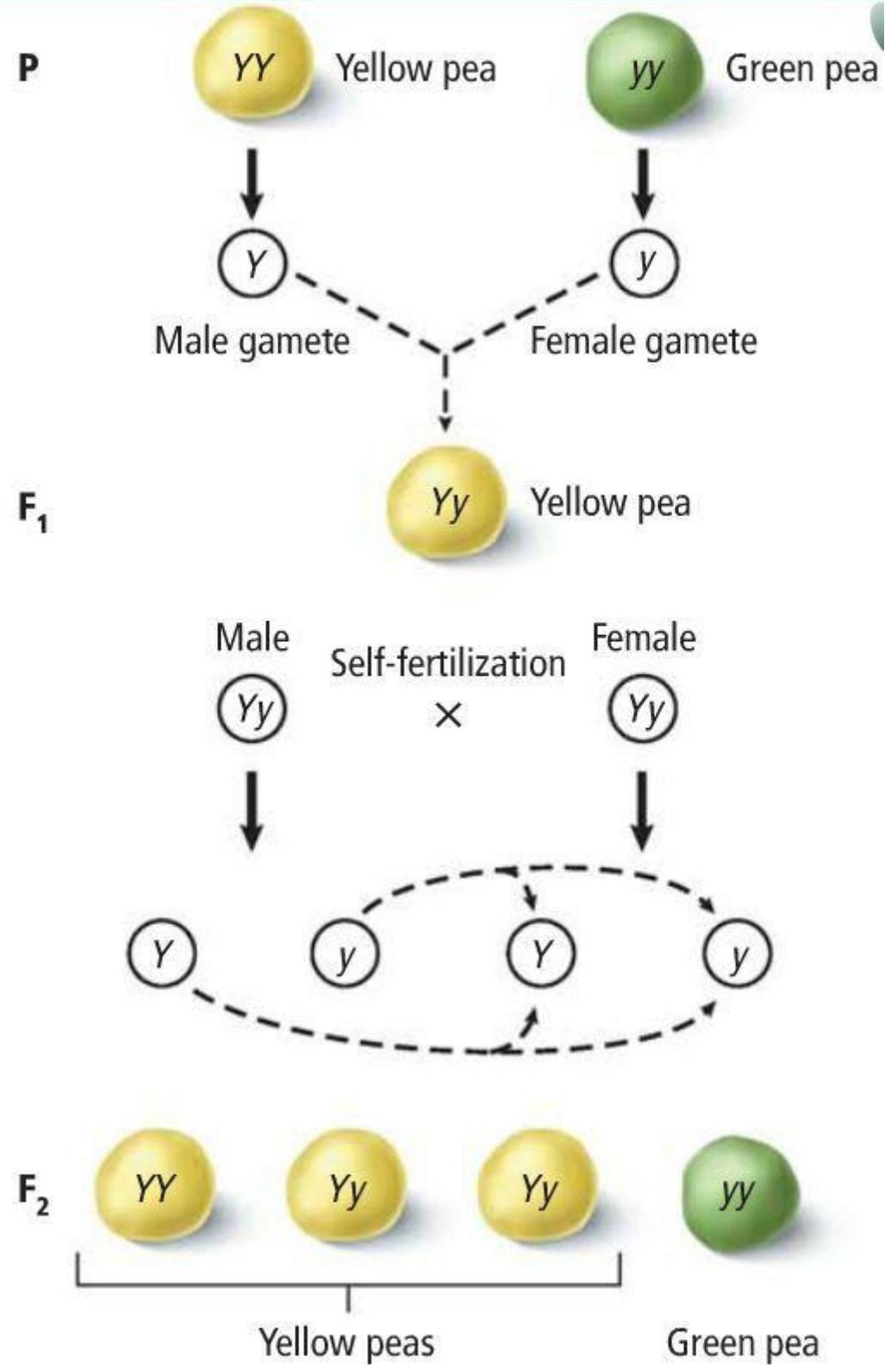
etc.



*Traits that Mendel observed:*



Pea plants can be self-fertilized or cross-fertilized



True-Breeding Plants -always  
create plants that look like  
themselves

Hybrids – offspring of  
true-breeding plants

Tall x Short = Hybrid

Some traits are dominant over others.

Tall x Short = all tall offspring (hybrids)

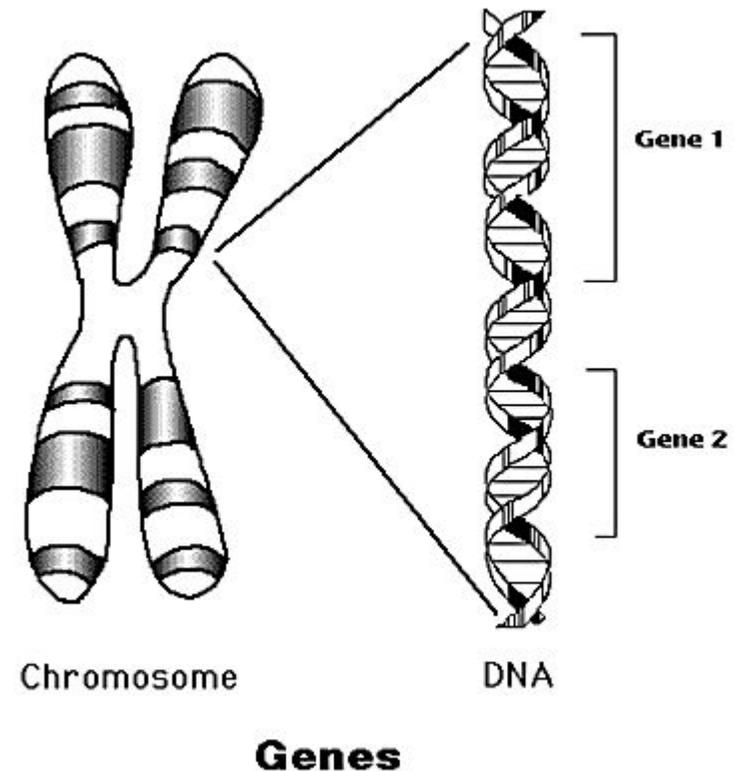
\*Tall is the dominant trait

\* Short is recessive

Mendel discovered that each trait is controlled by two factors (alleles)

Genes – factors that determine your traits

Genes are located on chromosomes



Quick Check - What do we know so far?

1. The “Father of Genetics” is \_\_\_\_\_
2. Genetics is the study of \_\_\_\_\_, which is how traits are passed from \_\_\_\_\_ to \_\_\_\_\_
3. Mendel studied what organism? \_\_\_\_\_
4. If one trait covers up another one, we say that it is \_\_\_\_\_,  
the one that is covered up is \_\_\_\_\_
5. A “true-breeding” plant is one that can only produce plants like itself    a) true    b) false
6. If a tall and a short plant are crossed, it will create a  
a) zygote                      b) gene                      c) hybrid

# Mendel's Experiments

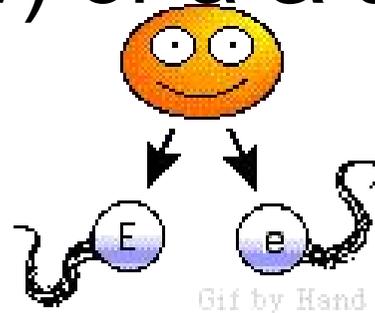
Table 1 Traits Compared by Mendel							
Traits	Shape of Seeds	Color of Seeds	Color of Pods	Shape of Pods	Plant Height	Position of Flowers	Flower Color
Dominant trait	Round 	Yellow 	Green 	Full 	Tall 	At leaf junctions 	Purple 
Recessive trait	Wrinkled 	Green 	Yellow 	Flat, constricted 	short 	At tips of branches 	White 

# Explaining the Cross

When a parent makes sperm or eggs, their genes separate

(PRINCIPLE OF SEGREGATION)

The GAMETES (egg or sperm) contain either a *A* allele (Yellow) or a *a* allele (green)



## Male Pea Parent

		<b>A</b>	<b>a</b>
<b>Female Pea Parent</b>	<b>A</b>	<b>AA</b>	<b>Aa</b>
	<b>a</b>	<b>aA</b>	<b>aa</b>

**A = Yellow Seeds    a = Green Seeds**

**Because a is recessive, only aa has green seeds.**

**An Example of a Mendelian Genetic Trait**

**GENOTYPE** - what genes, letters,  
the organism has (AA, Aa, aa)

If the alleles are the **same** it is referred to as homozygous  
and if they are **different**, then it is heterozygous.

**PHENOTYPE** - what it looks like  
(yellow or green)



Check for understanding

7. The passing of traits from parents to offspring is known as \_\_\_\_\_

8. Who was the father of genetics? \_\_\_\_\_

9. Genes are located on \_\_\_\_\_

10. Every gene is made of two

- a. genotypes      b. alleles      c. cells

11. The organism's outward appearance, such as wrinkled seeds are referred to as the

- a) phenotype      b) genotype

12. The letters (ex. AA) that represent the traits are referred to as the a) phenotype b) genotype

13. An organism that has two different alleles, or letters, such as Aa is: a) homozygous b) heterozygous

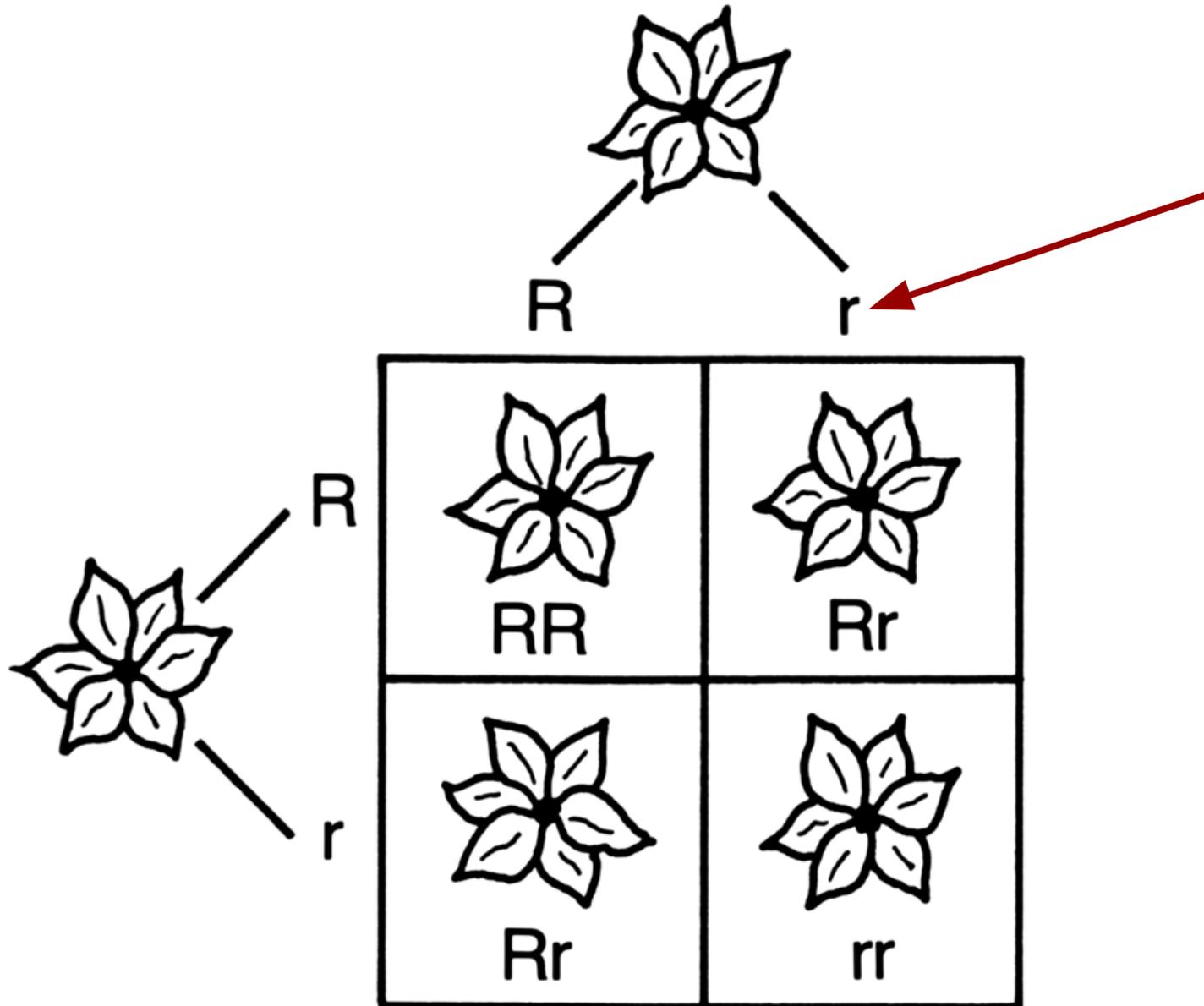
14. An organism that has two of the same alleles, or letters, such as AA is: a) homozygous b) heterozygous

15. Which of the following sets would represent Mendel's Parent (P) generation in our example?

a) AA x AA                      b) Aa x Aa                      c) AA x aa

16. When two different alleles occur together, such as Aa, the one that is expressed is a) dominant b) recessive

17. What is the diagram shown below called?



What does this letter actually represent?

Check for understanding

18. A one-eyed purple people eater is crossed with a two eyed purple people eater. All of their offspring have two eyes. Which trait is dominant?



19. If you use the letter E for this gene. What is the genotype of the offspring if the parents were  
 $EE \times ee$



20. If you crossed the offspring with each other? How many of the new offspring would you expect to have two eyes?

$EE$  = two eyes

$Ee$  = two eyes

$ee$  = one eye