

# 11–3 Exploring Mendelian Genetics



# Independent Assortment

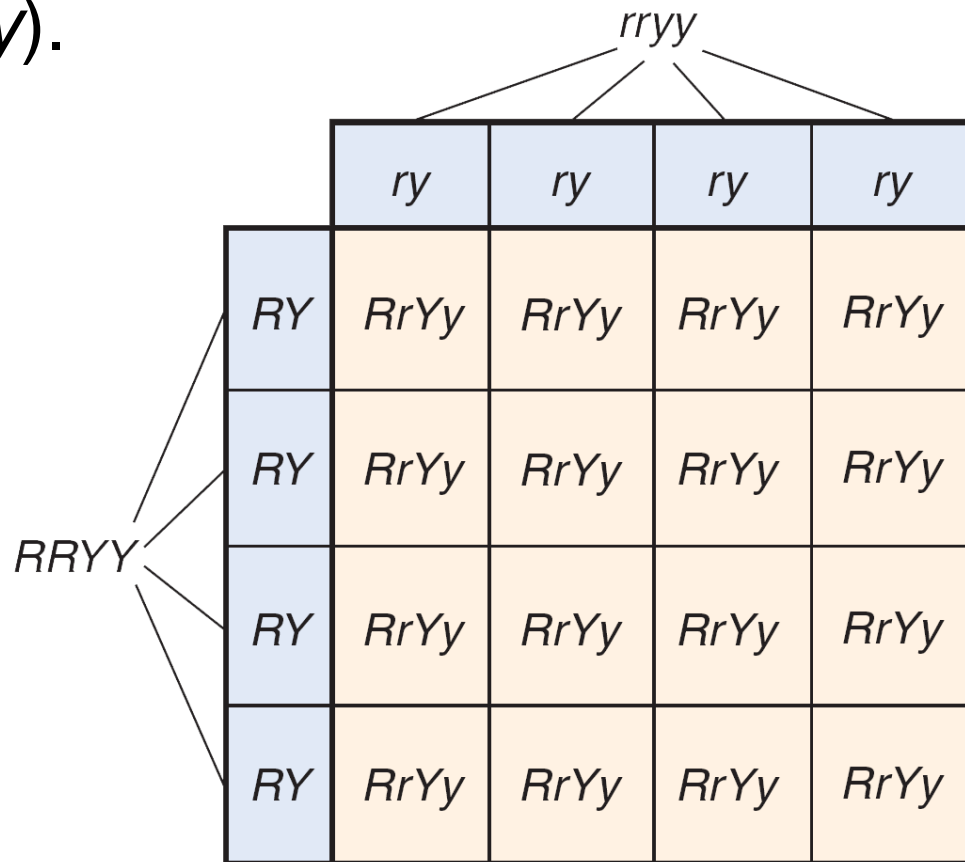
To determine if the segregation of one pair of alleles affects the segregation of another pair of alleles, Mendel performed a two-factor cross.

## The Two-Factor Cross: $F_1$

Mendel crossed true-breeding plants that produced round yellow peas (genotype  $RRYY$ ) with true-breeding plants that produced wrinkled green peas (genotype  $rryy$ ).

All of the  $F_1$  offspring produced round yellow peas ( $RrYy$ ).

The alleles for round ( $R$ ) and yellow ( $Y$ ) are dominant over the alleles for wrinkled ( $r$ ) and green ( $y$ ).

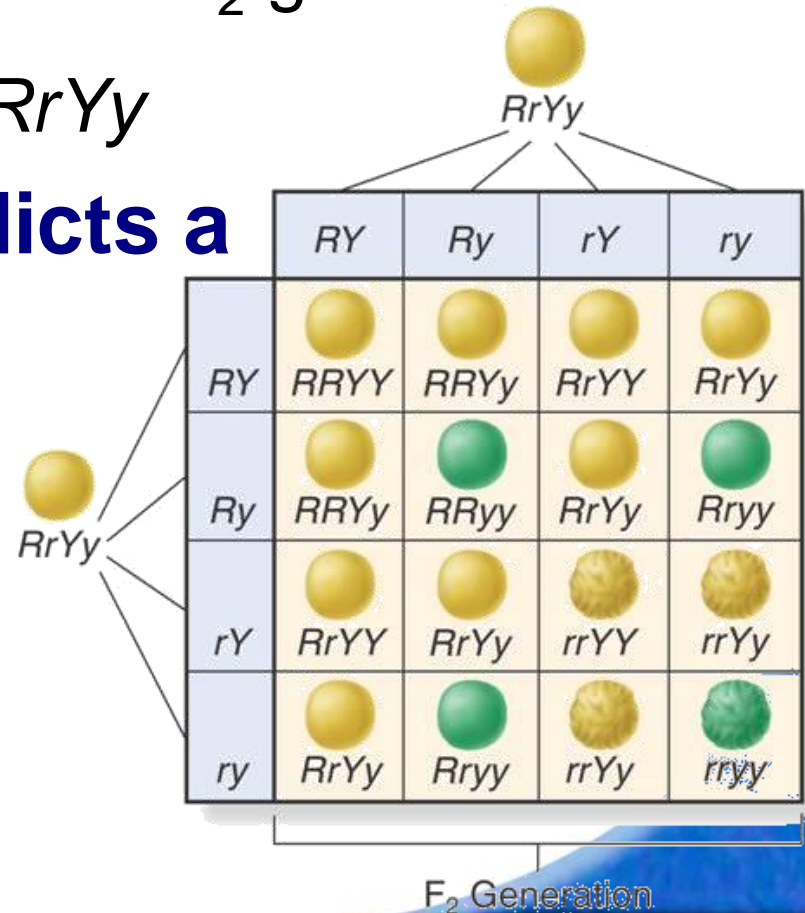


## The Two-Factor Cross: F<sub>2</sub>

Mendel crossed the heterozygous F<sub>1</sub> plants (*RrYy*) with each other to determine if the alleles would segregate from each other in the F<sub>2</sub> generation.

$$RrYy \times RrYy$$

The Punnett square predicts a **9 : 3 : 3 : 1 ratio** in the F<sub>2</sub> generation.



In Mendel's experiment, the F<sub>2</sub> generation produced the following:

- some seeds that were round and yellow
- some seeds that were wrinkled and green
- some seeds that were round and green
- some seeds that were wrinkled and yellow

The alleles for seed shape segregated independently of those for seed color. This principle is known as **independent assortment**.

Genes that segregate independently do not influence each other's inheritance.

Mendel's experimental results were very close to the 9 : 3 : 3 : 1 ratio predicted by the Punnett square.

Mendel had discovered the principle of independent assortment.



**The principle of independent assortment states that genes for different traits can segregate independently during the formation of gametes.**

Independent assortment helps account for the many genetic variations observed in plants, animals, and other organisms.

# A Summary of Mendel's Principles

- Genes are passed from parents to their offspring.
- If two or more forms (alleles) of the gene for a single trait exist, some forms of the gene may be dominant and others may be recessive.
- In most sexually reproducing organisms, each adult has two copies of each gene. These genes are segregated from each other when gametes are formed.
- The alleles for different genes usually segregate independently of one another.



Another example – F = fast, f = slow

R = Red, r = blue

Ffrr x ffRr


## Results of cross

**Genotypes:**

**Ratio =**

**Phenotypes:**

**Ratio=**

# 11-3 Section QUIZ

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## 11-3 Section QUIZ

- 1 In a cross involving two pea plant traits, observation of a 9 : 3 : 3 : 1 ratio in the  $F_2$  generation is evidence for
- a. the two traits being inherited together.
  - b. an outcome that depends on the sex of the parent plants.
  - c. the two traits being inherited independently of each other.
  - d. multiple genes being responsible for each trait.

## 11-3 Section QUIZ

- 5 Mendel's principles apply to
- a. pea plants only.
  - b. fruit flies only.
  - c. all organisms.
  - d. only plants and animals.