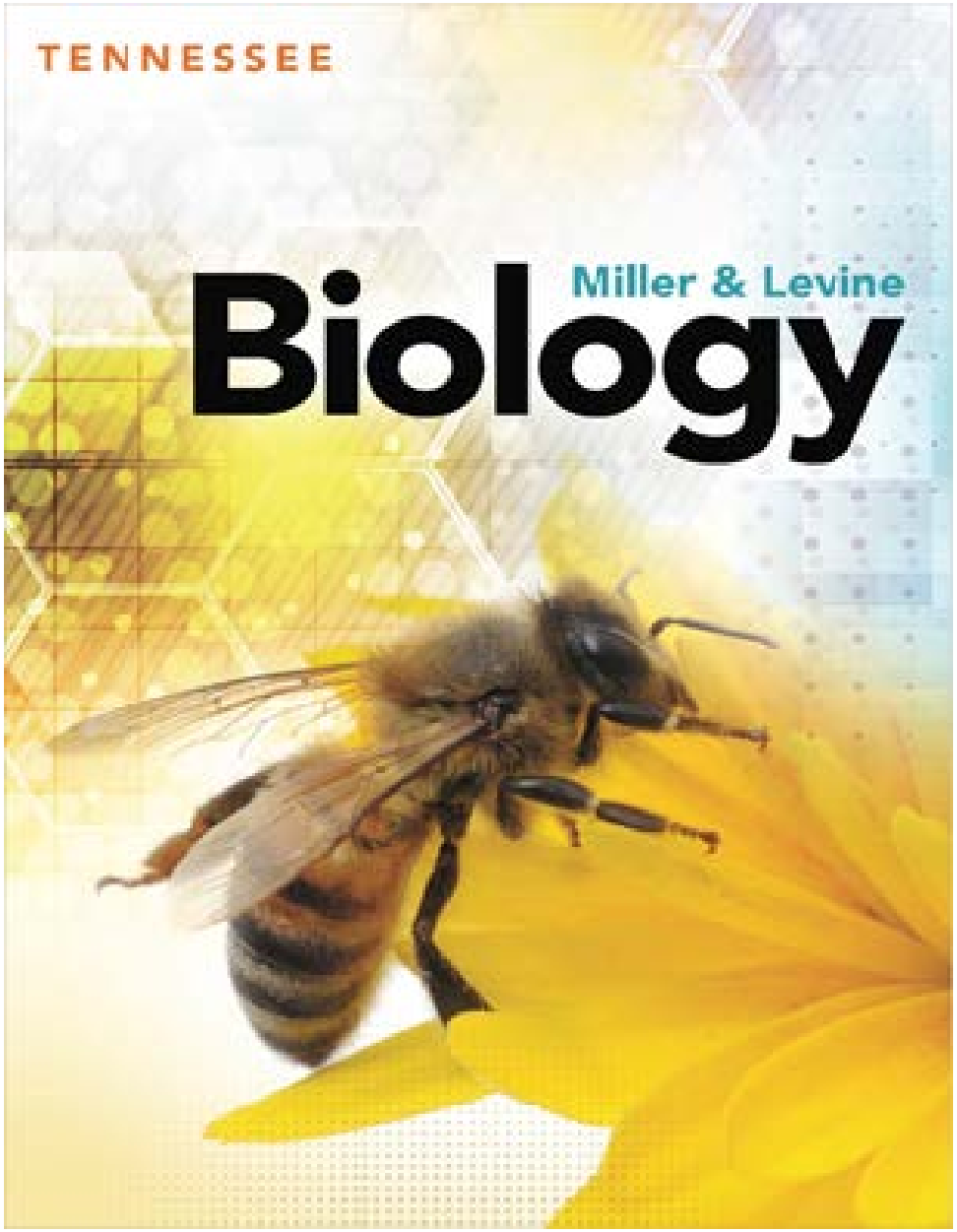


Lesson Overview

12.1 The Work of Gregor Mendel

Every living thing has a set of characteristics inherited from its parents.

The delivery of characteristics from parent to offspring is called **heredity**.

The study of heredity is **genetics**.

The Work of Gregor Mendel

The modern science of genetics was founded by an Austrian monk named Gregor Mendel.

Mendel experimented with pea plants.

The Role of Fertilization

During sexual reproduction, male (pollen or sperm) and female (egg) reproductive cells join in a process known as **fertilization** to produce a new cell.

In peas, this new cell develops into a tiny embryo encased within a seed.

The Role of Fertilization

Pea flowers can be **self-pollinating** - sperm fertilize egg cells from the same flower.

self-pollination results in offspring with a single parent.

The Role of Fertilization

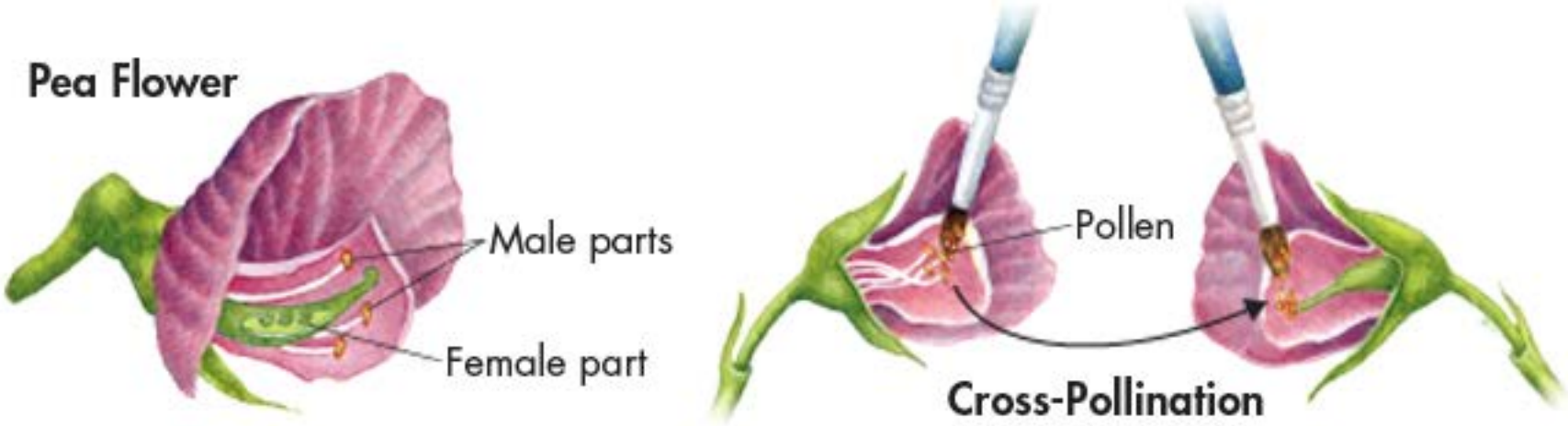
plants that are "**true-breeding**," are self-pollinating, and will produce offspring identical to themselves.

the traits of each successive generation would be the same.

trait - specific characteristic of an individual, such as seed color or plant height.

The Work of Gregor Mendel

Mendel “crossed” his stocks of true-breeding plants—he caused one plant to reproduce with another plant.



The Role of Fertilization

This process, known as cross-pollination, produces a plant that has two different parents.

Cross-pollination allowed Mendel to breed plants with traits different from those of their parents and then study the results.

Mendel crossed plants with seven contrasting characteristics and then studied their offspring.

The offspring of crosses between parents with different traits are called **hybrids.**

the original pair of plants (the parents) are called the P, or parental, generation.

The offspring are called the F_1, or "first filial," generation.

Mendel's Seven F_1 Crosses on Pea Plants

	Seed Shape	Seed Color	Seed Coat	Pod Shape	Pod Color	Flower Position	Plant Height
P	Round x Wrinkled	Yellow x Green	Gray x White	Smooth x Constricted	Green x Yellow	Axial x Terminal	Tall x Short
F_1	Round	Yellow	Gray	Smooth	Green	Axial	Tall

For each trait in Mendel's experiments, all the F1 offspring had the characteristics of only one parent

the trait of the other parent seemed to have disappeared.

Mendel's Seven F_1 Crosses on Pea Plants

	Seed Shape	Seed Color	Seed Coat	Pod Shape	Pod Color	Flower Position	Plant Height
P	Round X Wrinkled	Yellow X Green	Gray X White	Smooth X Constricted	Green X Yellow	Axial X Terminal	Tall X Short
F_1	Round	Yellow	Gray	Smooth	Green	Axial	Tall

Genes and Alleles

Mendel drew two conclusions.

1. An individual's characteristics are determined by factors passed from parents to offspring. These factors are called **genes**. The different forms of genes are **alleles.**

2. **principle of dominance** - some alleles are dominant and others are recessive

Dominant and Recessive Traits

An organism with at least one dominant allele for a particular form of a trait will exhibit that form of the trait.

An organism with a recessive allele for a particular form of a trait will exhibit that form only when the dominant allele for the trait is not present.

Dominant and Recessive Traits

In Mendel's experiments, the allele for tall plants was dominant and the allele for short plants was recessive. Likewise, the allele for yellow seeds was dominant over the recessive allele for green seeds

Mendel's Seven F_1 Crosses on Pea Plants

	Seed Shape	Seed Color	Seed Coat	Pod Shape	Pod Color	Flower Position	Plant Height
P	Round X Wrinkled	Yellow X Green	Gray X White	Smooth X Constricted	Green X Yellow	Axial X Terminal	Tall X Short
F_1	Round	Yellow	Gray	Smooth	Green	Axial	Tall

Segregation

How are different forms of a gene distributed to offspring?

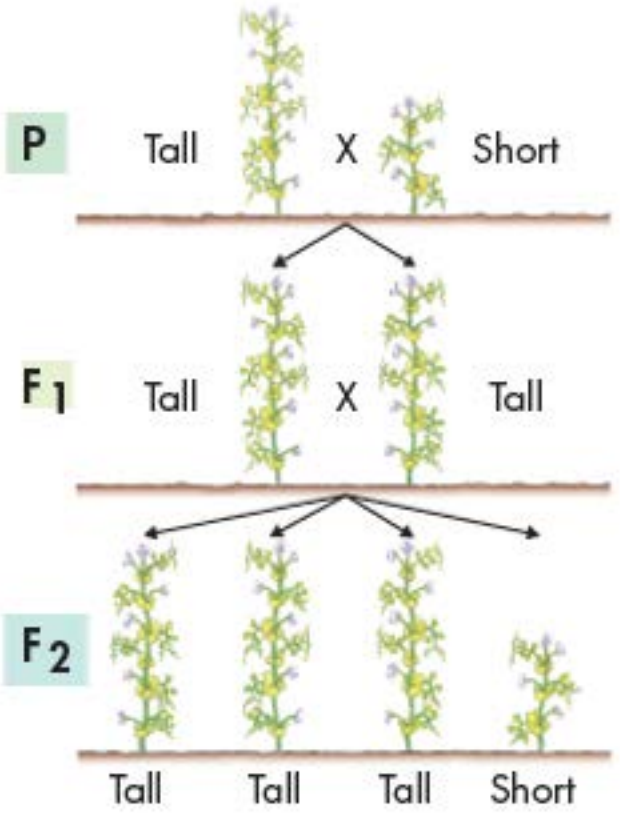
During gamete formation, the alleles for each gene segregate from each other, so that each gamete carries only one allele for each gene.

The Work of Gregor Mendel

Mendel wanted to find out what had happened to the traits that disappeared in the F1 generation.

He allowed all F_1 hybrids to self-pollinate.

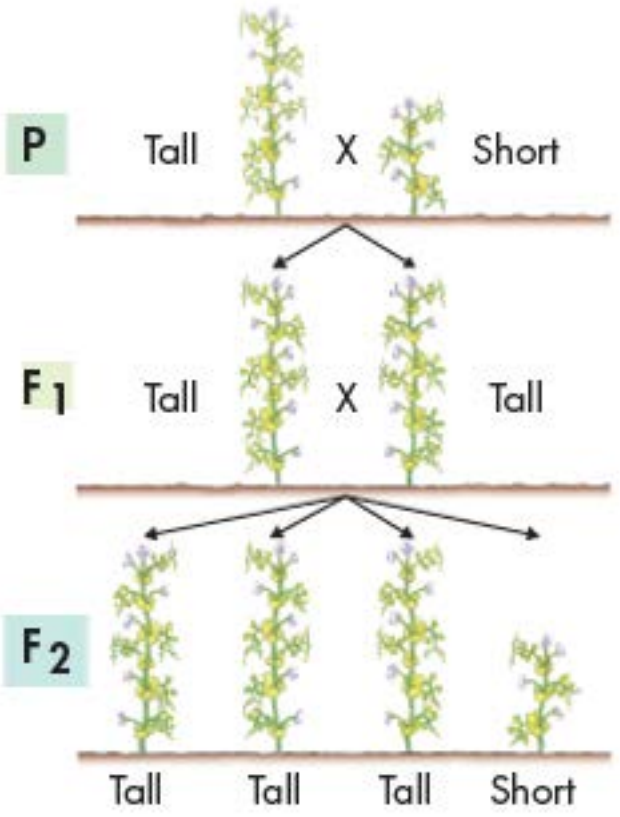
The offspring of an F_1 cross are called the F2 generation.



The Work of Gregor Mendel

Mendel discovered the traits controlled by the recessive alleles reappeared in the second generation.

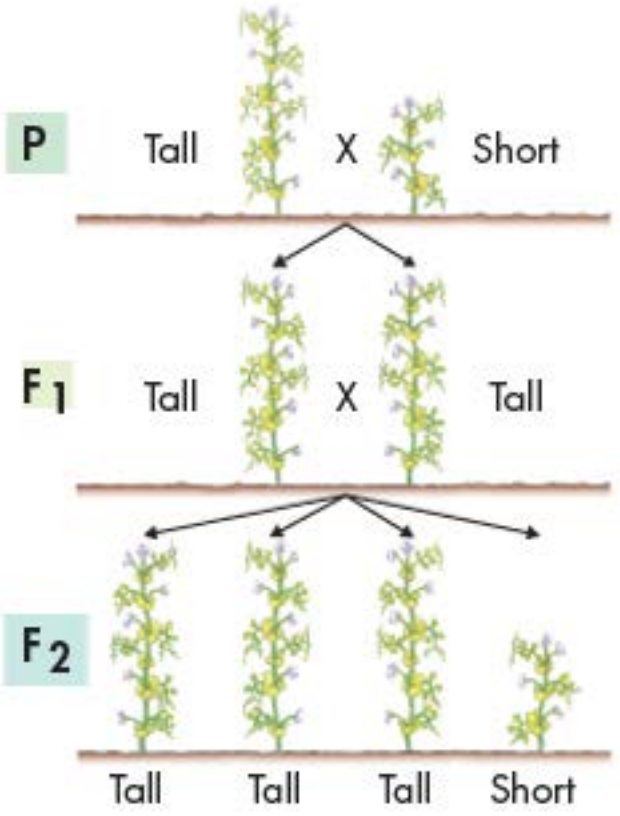
Roughly one fourth of the F2 plants showed the trait controlled by the recessive allele.



Explaining the F_1 Cross

a dominant allele masked the recessive allele unseen in the F_1 generation.

The reappearance of the recessive trait in the F2 generation indicated that the allele had separated from the dominant allele.



Explaining the F1 Cross

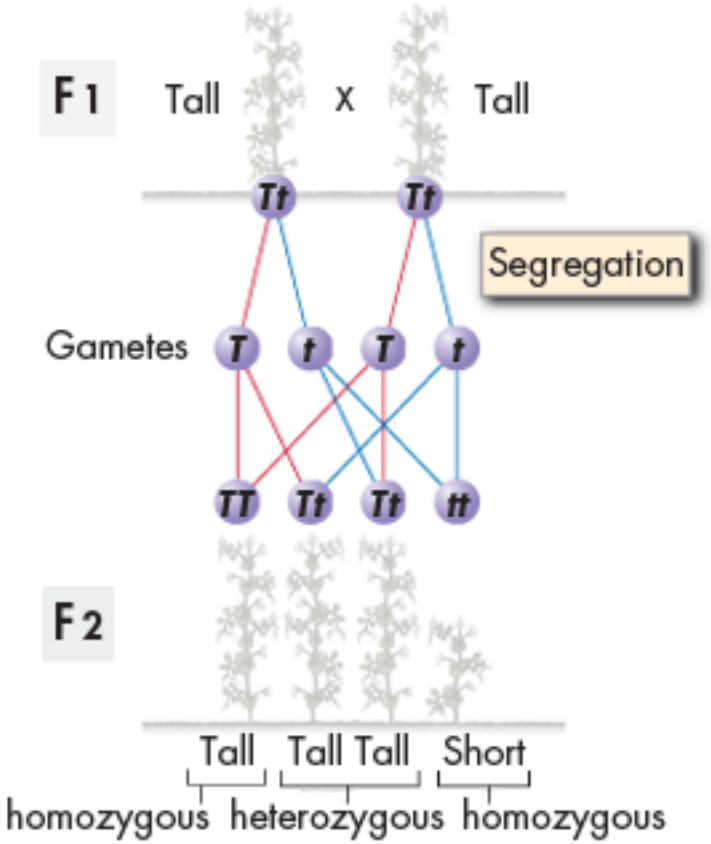
How did this separation, or **segregation**, of alleles occur?

Mendel suggested that the alleles in the F_1 plants must have segregated from each other during the formation of the sex cells, or **gametes**.

The Formation of Gametes

When each parent produces gametes, the alleles for each gene segregate from one another, so that each gamete carries only one allele for each gene.

Each gamete carries only half the total amount of genetic info necessary to create an adult organism.



The Formation of Gametes

When two gametes combine during fertilization, the new individual receives two alleles of each gene – one allele from the male gamete (sperm) and one allele from the female gamete (egg).