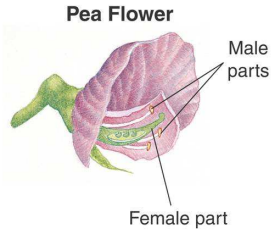
11-1 The Work of Gregor Mendel

Gregor Mendel's Peas

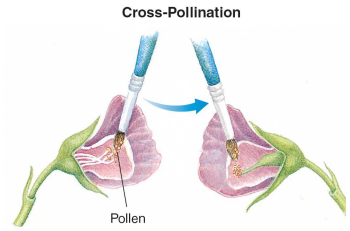
Genetics is the scientific study of heredity**.**
Heredity is the inheritance of traits.

Gregor Mendel was an Austrian monk. His work was important to the understanding of heredity.
Mendel carried out his work with ordinary garden peas.
Mendel knew that

- the male part of each flower "stamen" produces pollen, (male reproductive cells like animal sperm).
- the female part of the flower "pistil" produces seeds (female reproductive cells like animal eggs).



During sexual reproduction, sperm and egg cells join in a process called fertilization.
Fertilization produces a new cell.
Pea flowers are self-pollinating.
Pollen cells fertilize the seed cells in the same flower.
The seeds that are produced by self-pollination inherit **all** of their characteristics from the single plant that bore them.
Mendel had **true-breeding** or **pure-bred** pea plants that, if allowed to self-pollinate, would produce offspring identical to themselves.
Mendel wanted to produce seeds by joining male and female reproductive cells from two different plants.
He cut away the pollen-bearing male parts of the plant and dusted the plant's flower with pollen from another plant.
This process is called **cross-pollination.**
Pollinating one plant with the pollen from another plant.
Mendel was able to produce seeds that had two different parents.



Genes and Dominance

A **trait** is a specific characteristic that varies from one individual to another.
Mendel studied **seven pea plant traits**, each with two contrasting characters.
He crossed plants with each of the seven contrasting characters and studied their offspring.
Each original pair of plants is the **P (parental)** generation.
The offspring are called the **F1, or "first filial,"** generation.
The offspring of crosses between parents with different traits are called **hybrids**.
The F1 hybrid plants all had the character of only one of the parents.

Mendel's Seven F_1 Crosse

	Seed Shape	Seed Color	Seed Coat Color	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

Mendel's first conclusion was that biological inheritance is determined by factors that are passed from one generation to the next.
Today, scientists call the factors that determine traits **genes**.
Each of the traits Mendel studied was controlled by **one gene** that occurred in **two contrasting forms** that produced different characters for each trait.
The different forms of a gene are called **alleles.**
Mendel's second conclusion is called the **principle of dominance**.
The principle of dominance states that some alleles are dominant and others are recessive.
An organism with a dominant allele for a trait will always exhibit that form of the trait.
An organism with the recessive allele for a trait will exhibit that form only when the dominant allele for that trait is not present.
Segregation
Mendel crossed the F1 generation with itself to produce the F2 (second filial) generation.
The traits controlled by recessive alleles reappeared in one fourth of the F2 plants.
Mendel assumed that a dominant allele had masked the corresponding recessive allele in the F1 generation.
The trait controlled by the recessive allele showed up in some of the F2 plants.
The reappearance of the trait controlled by the recessive allele indicated that at some point the allele for shortness had been separated, or **segregated**, from the allele for tallness.
Mendel suggested that the alleles for tallness and shortness in the F1 plants segregated from each other during the formation of the sex cells, or **gametes.**
When each F1 plant flowers and produces gametes, the two alleles segregate from each other so that each gamete carries only a single copy of each gene.
Therefore, each F1 plant produces two types of gametes—those with the allele for tallness, and those with the allele for shortness.
Alleles separate during gamete formation.