

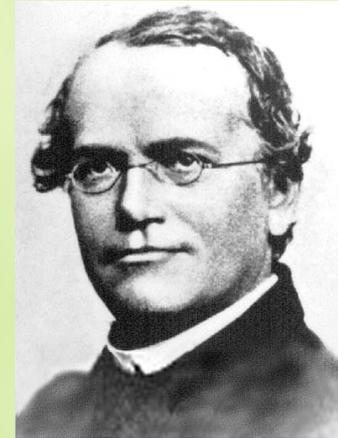


Objectives

- ✿ Describe the contributions of Gregor Mendel to the science of genetics.
- ✿ Explain the Law of Segregation.
- ✿ Explain the Law of Independent Assortment.
- ✿ Explain the concept of dominance.
- ✿ Define the terms: gene, purebred, hybrid, F_1 , F_2 , dominant, recessive, alleles, homozygous, heterozygous, genotype, phenotype.

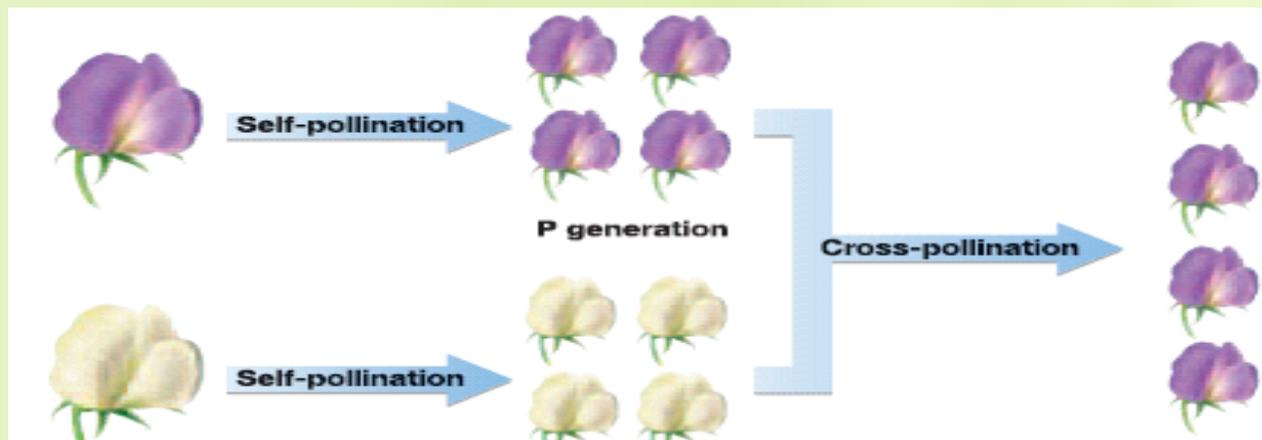
Once Upon a Time...

- ✿ In 1843, a monk named **Gregor Mendel** was in charge of the garden at his monastery.
- ✿ He began to make observations about the different **traits** of pea plants (seed color, shape, height, etc...)
- ✿ Then he wondered what would happen if pollen from a pea plant with one trait would **cross-pollinate** a plant with a different trait.



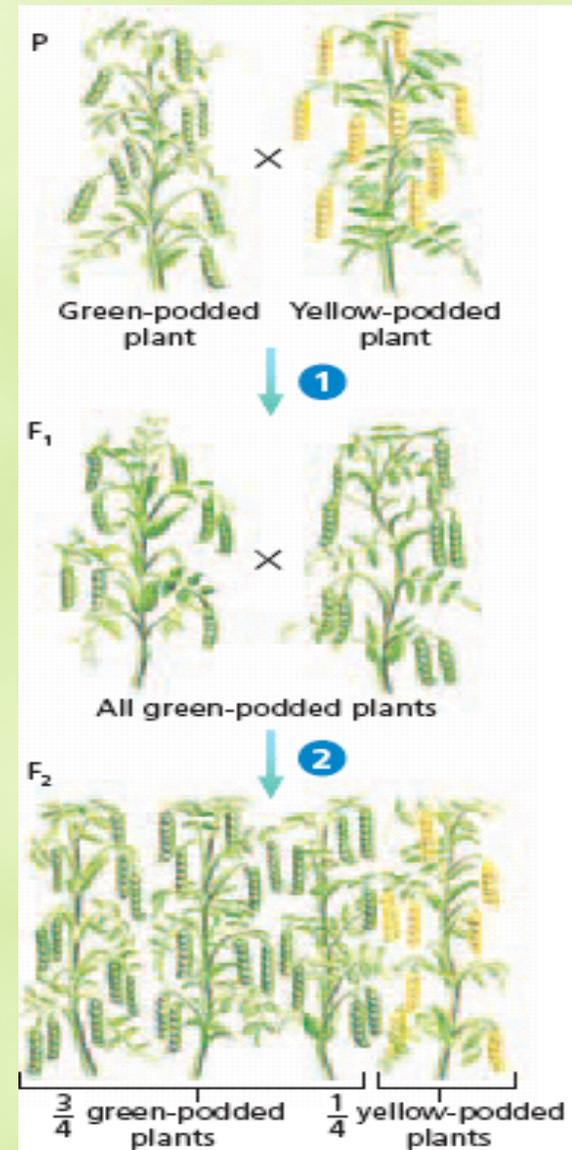
How Did He Do That?

- ✿ Mendel started with true-breeding, or purebred plants that, when self-pollinated, always produce offspring with the same trait.
- ✿ He then cross-pollinated plants with opposite purebred traits (purple flowers with white flowers.)
- ✿ The result was that the **first filial generation (F₁)** all produced purple flowers.
- ✿ This indicated that the genetic code for purple was **dominant** because it overpowered the genetic code for white.



What Happened Next?

- ✿ Mendel then cross-pollinated the plants from the F_1 generation to form the F_2 generation and something changed.
- ✿ He got 75% purple flowers and 25% white flowers.
- ✿ The same thing happened with other traits, like pod color.
- ✿ This indicated that the **recessive** trait could resurface.
- ✿ It also indicated that all plants must have a pair of **genes** for each trait.





Law of Segregation

- ✿ Mendel concluded that each parent must pass one gene for each trait to each of its offspring.
- ✿ This meant the genes for those traits must split during gamete production (meiosis) to give only one gene to each gamete.
- ✿ When 2 gametes fuse, the offspring would have one gene from the maternal parent and one from the paternal parent.
- ✿ This is known as the **Law of Segregation**.



Law of Independent Assortment

- ✿ Mendel also crossed plants that had more than one trait different (EXAMPLE: purple flowers, with yellow pods and white flowers with green pods.)
- ✿ He discovered that while some plants expressed the dominant trait for one characteristic, they could express the recessive trait for another.
- ✿ This meant that the traits were independent from each other and had no affect on each other.
- ✿ This is know as the **Law of Independent Assortment.**



What We Know Now

- ✿ Molecular genetics have supported Mendel's findings and has cleared up some of the confusion.
- ✿ We have learned that a code, or **genes**, for each trait can be found on the chromosomes.
- ✿ The alternative forms of a gene are called **alleles** (EXAMPLE: One allele is white flowers, the other allele is purple flowers.)
- ✿ We also know that some alleles are dominant and others are recessive, which means that when the dominant allele is present then that trait is always expressed.



Genotypes

- ✿ A **genotype** is an organisms genetic make up (which alleles it has.)
- ✿ If an organism has 2 alleles that are the same (EXAMPLE: Purple Flowers & Purple Flowers), then they are called **homozygous**, or **purebred**.
 - ✿ If the organism has 2 alleles for the dominant trait then they are **homozygous dominant** .
 - ✿ If the organism has 2 alleles for the recessive trait then they are **homozygous recessive** .
- ✿ If an organism has 2 different alleles (one dominant and one recessive), then it is called **heterozygous**, or **hybrid**.

Phenotypes

- ✿ The genotype will determine which physical characteristic is expressed.
- ✿ The physical trait that is expressed by a specific genotype is called the **phenotype**.
- ✿ It is possible to predict the genotypes, and therefore the phenotypes of offspring if we know the genotype of both parents.

Genotype [Alleles]	Phenotype [Trait]
Heterozygous (Hybrid) [EX: Purple/ White]	<i>Dominant</i> [<i>Purple</i>]
Homozygous Dominant (Purebred) [EX: Purple/ Purple]	<i>Dominant</i> [<i>Purple</i>]
Homozygous Recessive (Purebred) [EX: White/ White]	<i>Recessive</i> [<i>White</i>]

Monohybrid Crosses

- ✿ Biologists use a diagram called a **punnett square** to determine the **probability**, or likelihood of a offspring expressing a certain phenotype.
- ✿ Start by placing the genotype of the mother on top and the genotype of the father on the left side.

- ✿ Capital letters represent the dominant allele (written first) and lowercase letters represent the recessive allele.
- ✿ Each box represents a possible offspring.

	B	b
B	BB	Bb
b	Bb	bb



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