11-1 The Work of Gregor Mendel

Gregor Mendel's Peas

Genetics is the scientific study of heredity**.**

Gregor Mendel- the "Father of Genetics".

- Austrian monk
- Worked with garden peas **<u>to study inheritance</u>**

Sexual reproduction

-2 parents

-sperm and egg cells join in a process called **fertilization**

-Cell not genetically identical to parent

Asexual reproduction

-1 parent

-Parent has both male and female sex organs

-Cell genetically identical to parent

P (parental) generation- original plants

F_1 (1st filial) generation- offspring of P generation

F_2 (2nd filial) generation- offspring of F_1 generation

X- is the symbol for crossing (breeding)

Mendel's Experiment

<u>Part 1</u>- Pure-bred Plants

1) Mendel grew true-breeding pea plants.

   -1 plant (1 parent)

   -allowed plant to self-pollinate (asexual reproduction)

   -offspring are pure bred for one trait

   -offspring's genes identical to parents

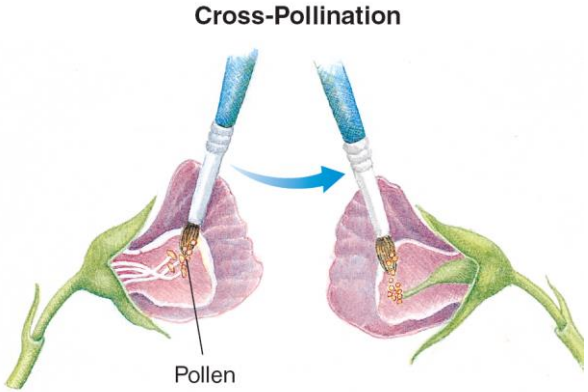
Mendel's Experiment

Part 1- Pure-bred Plants

Self-pollination

P_1 x P_1 = F_1 (identical to parent)

Mendel's Experiment



<u>Part 2</u>- Hybrid Plants

1) Mendel grew hybrid pea plants

-2 plants (2 parents)

-2 plants cross pollinate (sexual reproduction)

-Mendel cut the male parts of one plant and dusted its pollen on the female part of another plant.

-offspring are hybrids (mixture) of one trait

-offspring's genes a hybrid of parents

Mendel's Experiment

Part 2- Hybrid Plants

Cross-pollination

P1 x P2 = F1 (different from parents)

Genes and Dominance

A **trait** is a specific characteristic that varies from one individual to another.

Example- hair color, eye color

Genes and Dominance

Mendel studied seven pea plant traits, each with two contrasting characteristics.

Example- **Trait**- seed color

Characteristics- yellow or green

He crossed plants with certain traits and studied their offspring.

Genes and Dominance

Part 1

Mendel crossed true breeding plants of one characteristic of one trait.

P_1(Pure Tall) x P_1(Pure Tall) = F_1(Pure Tall)

F_1(Pure Tall) x F_1(Pure Tall) = F_2(Pure Tall)

F_2(Pure Tall) x F_2(Pure Tall) = F_3(Pure Tall)

**You could have crossed Pure Short

Offspring are always tall

Genes and Dominance

Part 2

Mendel crossed true breeding plants with two different characteristics of one trait.

P1(Pure Tall) x P2(Pure Short) = F1(Tall) [F1 always tall]

F1(Tall) x F1(Tall) = F2(Tall) and F2(Short) [F2 – some tall and some short]

Why did short disappear in F1 and comeback in F2?

Mendel's first conclusion:

Biological inheritance is determined by factors (genes) that are passed from parent to offspring.

Different forms of a gene are called **alleles.**

Mendel's second conclusion:

Principle of Dominance

some alleles are dominant and others are recessive.

Dominant allele- form of trait always exhibited.

•Dominant alleles- capital letter.

Recessive allele- form of trait only exhibited when the dominant allele for that trait is **not** present.

•Recessive alleles- lower case letter.

Why did the trait for shortness disappear in F1 and then reappear in F2?

Mendel assumed that the dominant allele masked the recessive allele in the F_1 generation.

The reappearance of the short 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 F_1 plants segregated from each other during the formation of the sex cells, or **gametes.**

Law of Segregation

When each F_1 plant produces gametes, the two alleles segregate from each other so that each gamete carries only a single copy of each gene.

Therefore, each F_1 plant produces two types of gametes—those with the allele for tallness, and those with the allele for shortness.

Alleles separate during gamete formation.