ArchitectsDaughter
Biology Master Notes | Term 2

Chapter 9: Heredity & Evolution

The Blueprint of Life: Heredity & Genetics

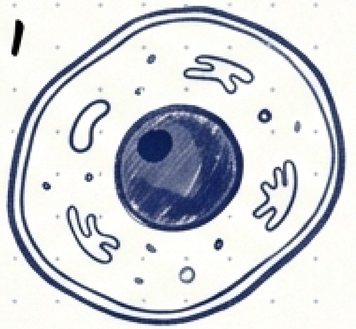
Heredity:

The process by which features of an organism are passed from one generation to another.

Genetics:

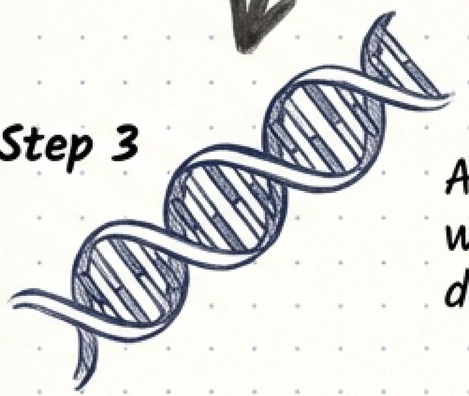
The branch of biology studying genes, heredity, and variations.

Step 1



Step 2

Step 3

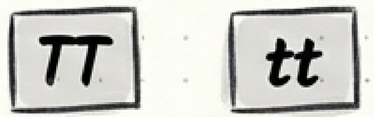
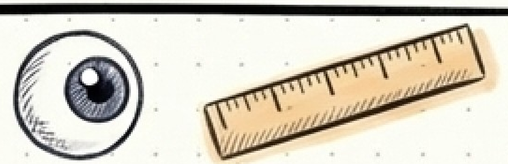
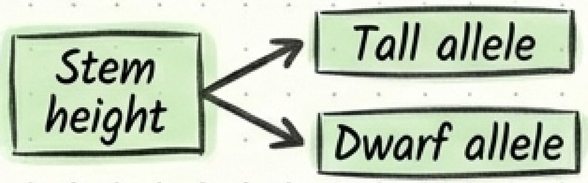


A highly complex molecule with a spirally coiled, double helical structure

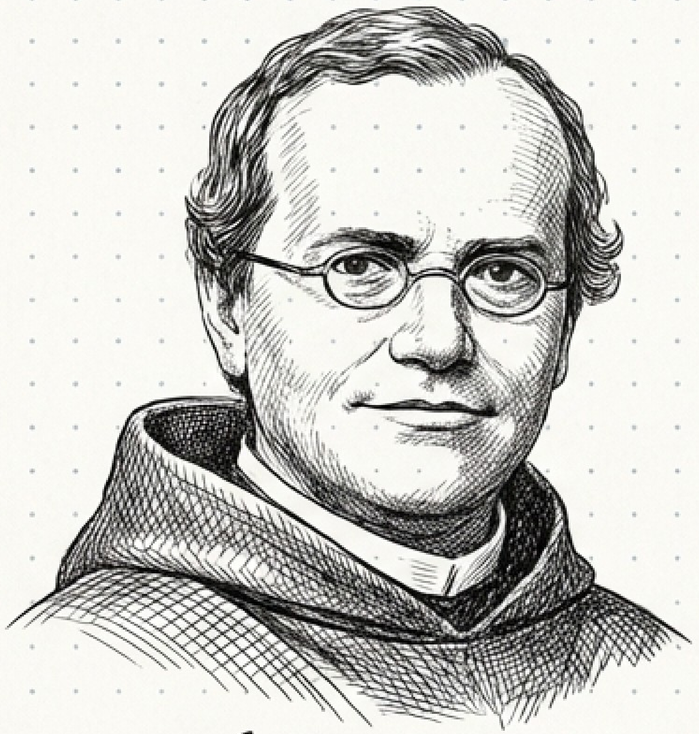
Step 4

Gene: The functional unit of heredity. Short stretches of DNA that code for a specific protein.

The Genetics Vocabulary Cheat Sheet

Term	Definition	Visual Example
Genotype	The genetic constitution or description of genes present.	
Phenotype	The observable, physical characteristics.	
Alleles	Alternative forms of a gene for a specific character.	
Dominant	The super-ruling allele that always expresses itself, masking the recessive.	
Recessive	The subordinate allele that remains unexpressed unless paired with another recessive.	

The Architect: Gregor Mendel & His Peas



The Father of Genetics. An Austrian Monk whose work laid the foundation of modern genetics.

7 Contrasting Traits in Pea Plants

Traits	Shape of seeds	Colour of seeds	Colour of pods	Shape of pods	Plant height	Position of flowers	Flower colour
Dominant trait	Round	Yellow	Green	Full	Tall	At leaf junction	Purple
Recessive trait	Wrinkled	Green	Yellow	Flat, constricted	Short	At tips of branches	White

We'll use these later!

Mendel's 3 Rules of Inheritance

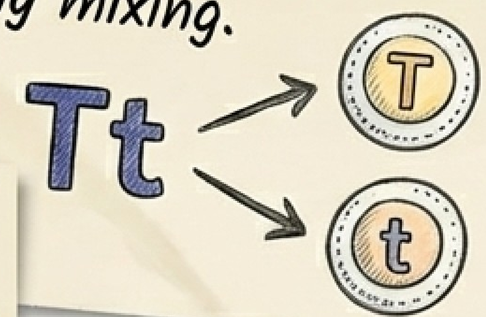
1. Law of Dominance

A gene has two contrasting alleles and one always expresses itself.

Tt → Dominant wins

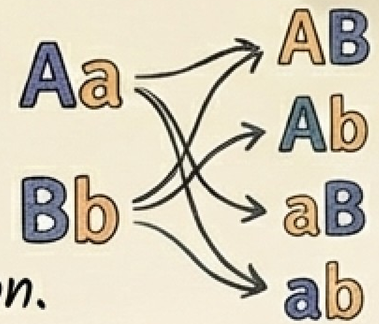
2. Law of Segregation

Traits get segregated completely during the formation of gametes without any mixing.



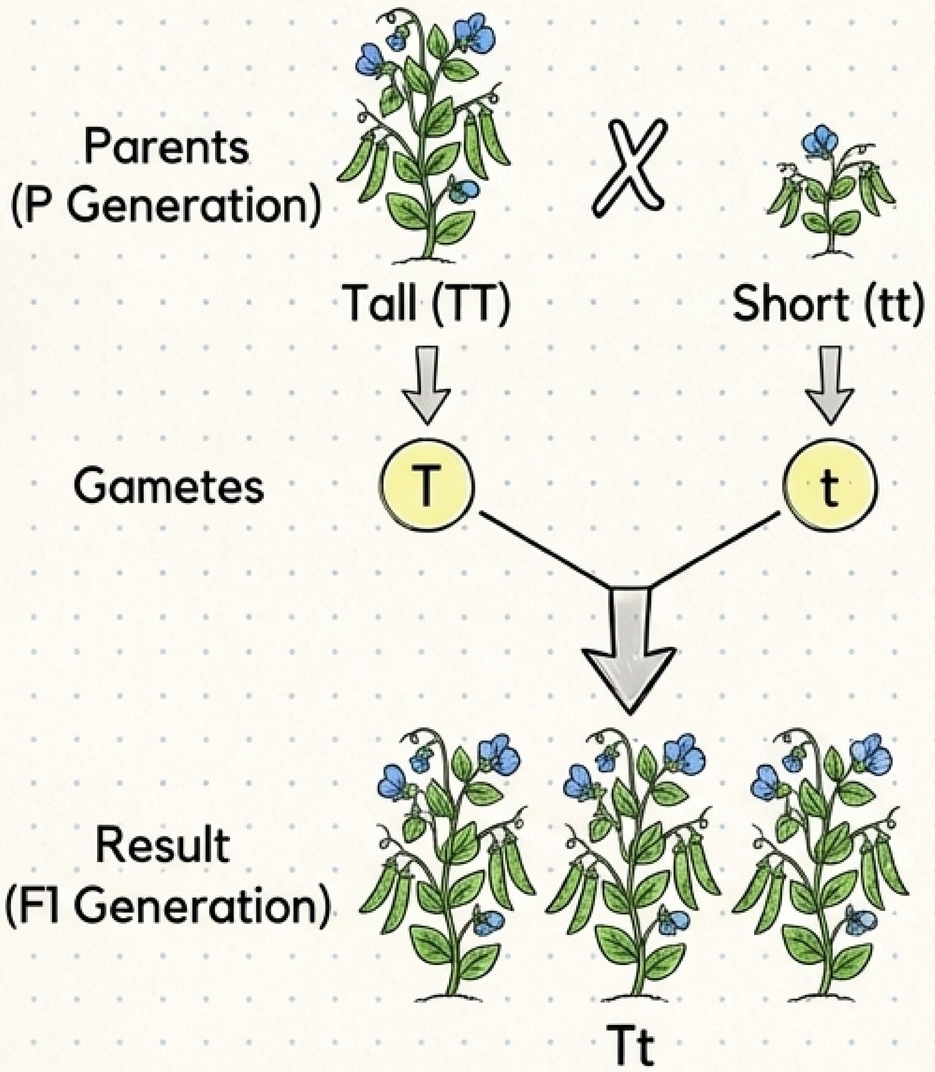
3. Law of Independent Assortment

Traits can segregate independently of different characters during gamete formation.



The Monohybrid Cross (Part 1: The Setup)

Crossing two organisms considering only a SINGLE pair of contrasting characters.



All F1 progeny are tall! There are no medium height plants. The recessive "t" trait is completely hidden by the dominant "T".

The Monohybrid Cross (Part 2: The F2 Generation)

Crossing the F1 plants: Tall (Tt) x Tall (Tt)

	T	t
T	TT (Tall)	Tt (Tall)
t	Tt (Tall)	tt (Short)

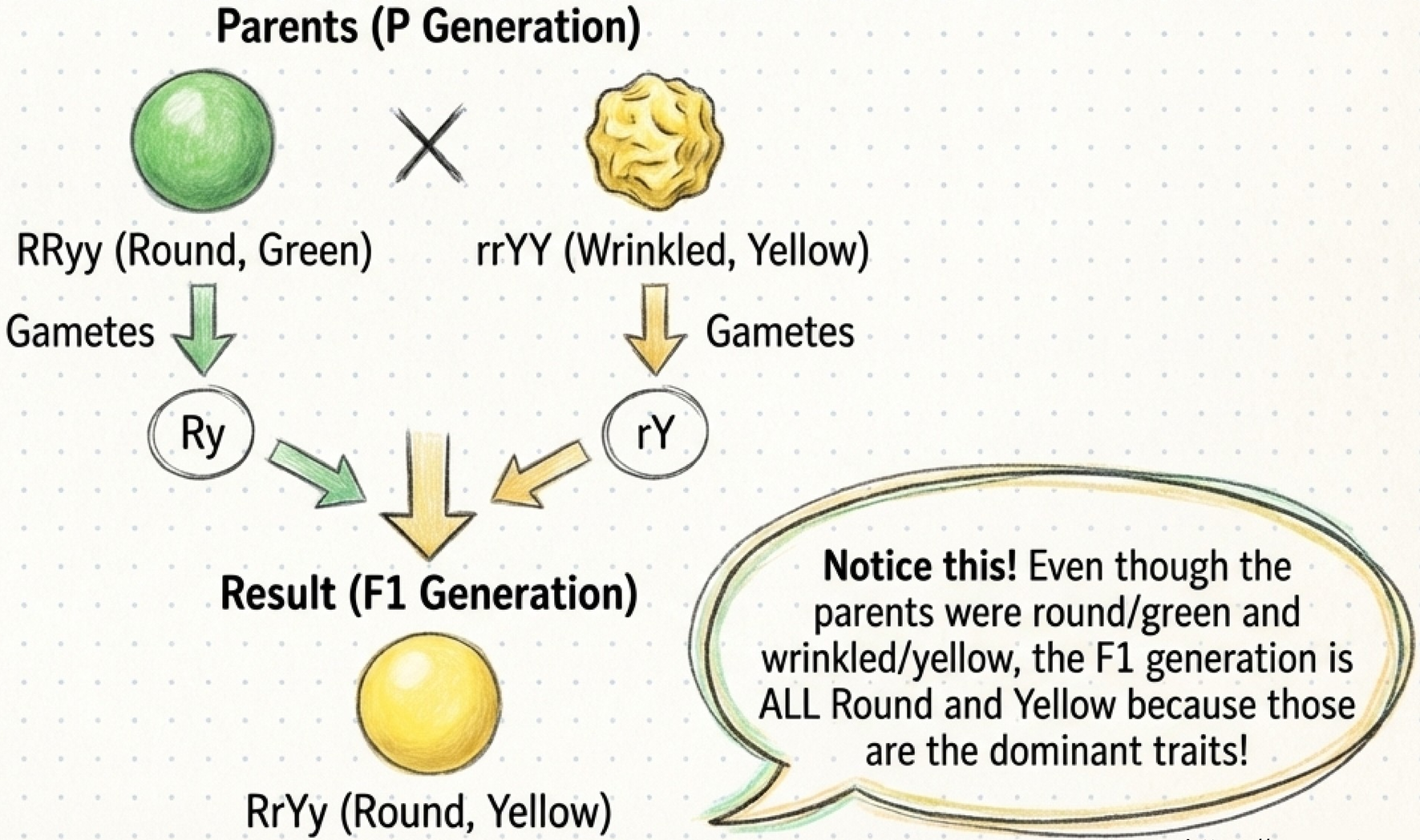
The Results

Phenotypic Ratio: 3 : 1

Genotypic Ratio: 1 : 2 : 1
(1 TT : 2 Tt : 1 tt)

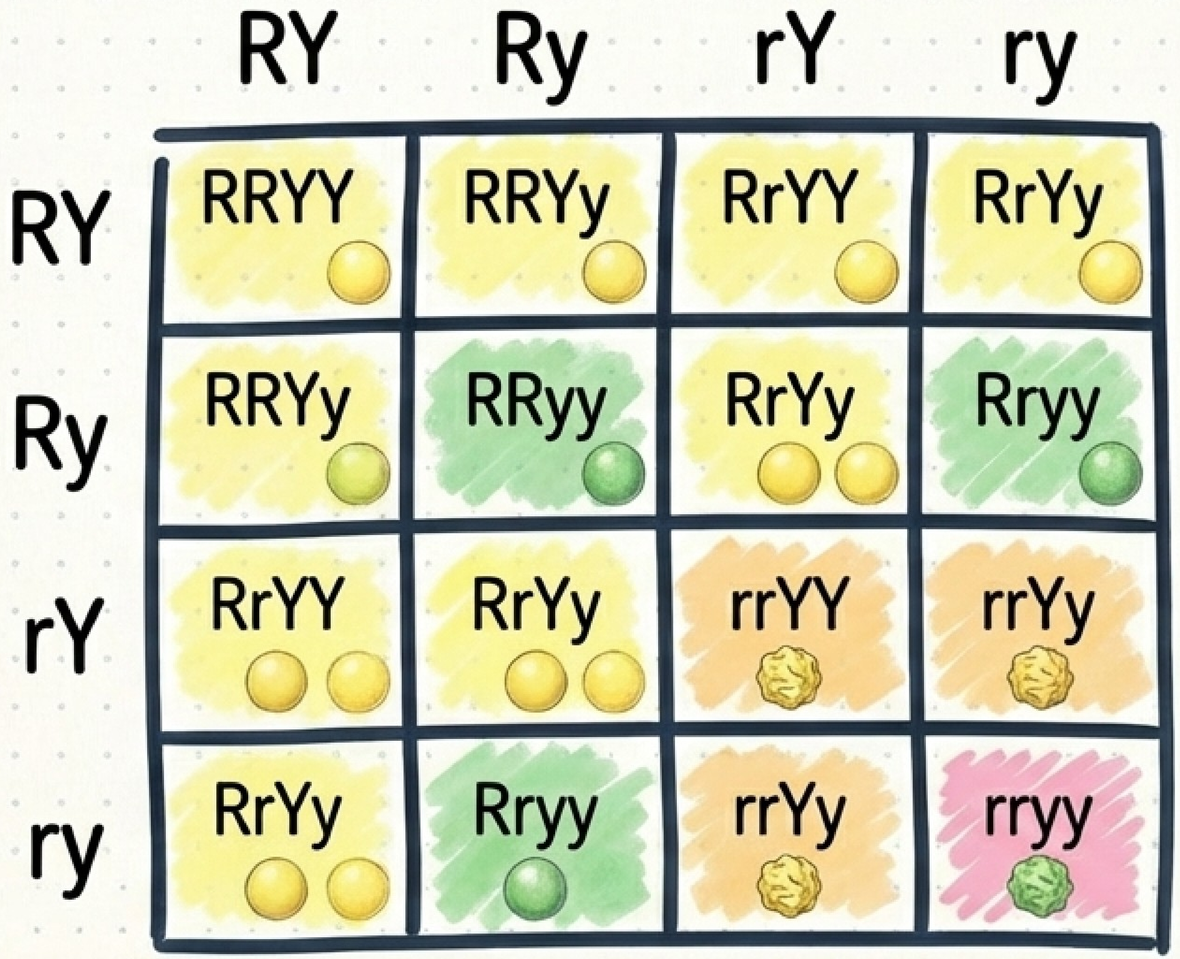
The Dihybrid Cross (Part 1: Two Traits at Once)

Crossing two organisms considering TWO pairs of contrasting characters simultaneously.



The Dihybrid Cross (Part 2: The F2 Generation)

Setup: F1 x F1 (RrYy x RrYy)



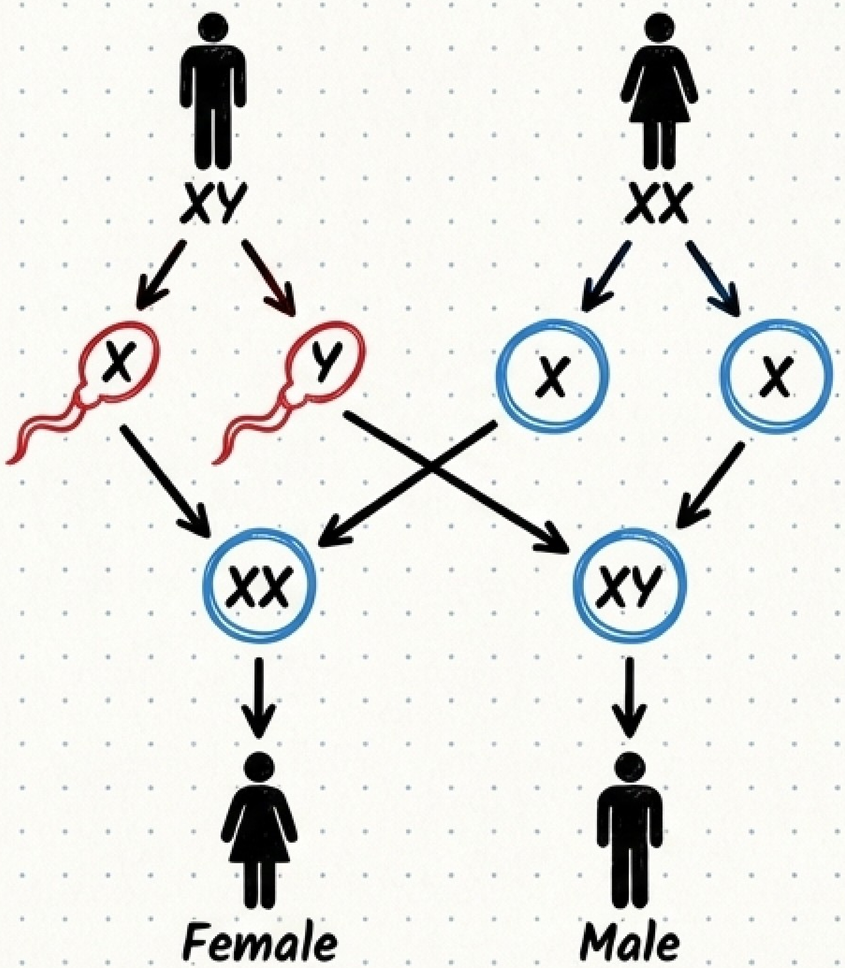
Results Matrix

Phenotypic Ratio: 9 : 3 : 3 : 1

Self-pollination of F1 gives parental phenotypes AND new recombinant mixtures!

The Human Element: Sex Determination

- Humans have 22 pairs of autosomes + 1 pair of sex chromosomes.
- Female = XX (similar). Male = XY (dissimilar).



The probability is always 50/50. The father's sperm (carrying either X or Y) is the deciding factor for the child's sex!

The Spice of Life: Understanding Variation

Variation is the measure of the difference between individuals of the same species. Offspring are never entirely identical to their parents.

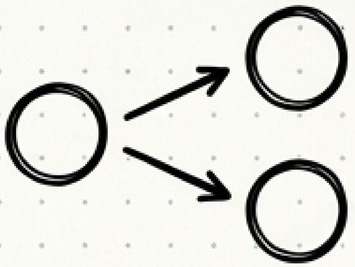
The Causes

The Causes

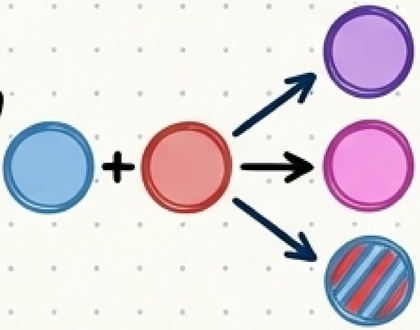
- Recombination (shuffling of genes during reproduction)
- Mutation (changes in DNA sequences)

Asexual vs. Sexual Reproduction

Asexual Reproduction:
Small amount of variation. Offspring are almost exact copies.



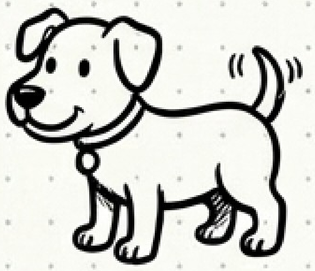
Sexual Reproduction:
Great variation! Long-term accumulation of these variations plays a massive role in evolution.



Acquired vs. Inherited Traits

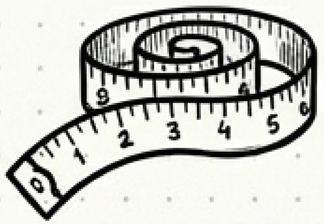
Acquired Traits (Somatic Variation)

- Takes place in body (somatic) cells.
- NEVER inherited or transmitted to the next generation.
- Developed during an individual's lifetime due to environment or experiences.


Inherited Traits (Gametic Variation)

- Takes place in reproductive cells (gametes).
- ALWAYS transferred to the next generation.
- Coded in the DNA blueprint.


Natural Selection: How Variations Survive

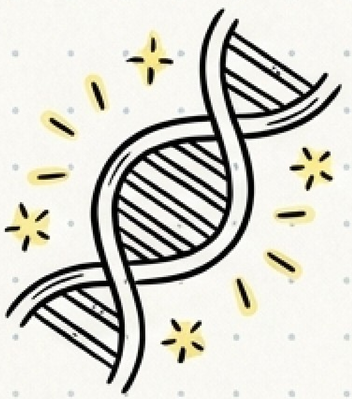
Changing natural conditions exert equal pressure on all existing species. The selection of variants by environmental factors drives evolution.

Species that are better adapted to changing conditions survive and reproduce (Selected by nature). Those that cannot adapt perish.

Speciation: The Recipe for a New Species

The formation of newer species from pre-existing ones due to the accumulation of variations.

Accumulation of Variations



+

Isolation / Stoppage of Gene Flow

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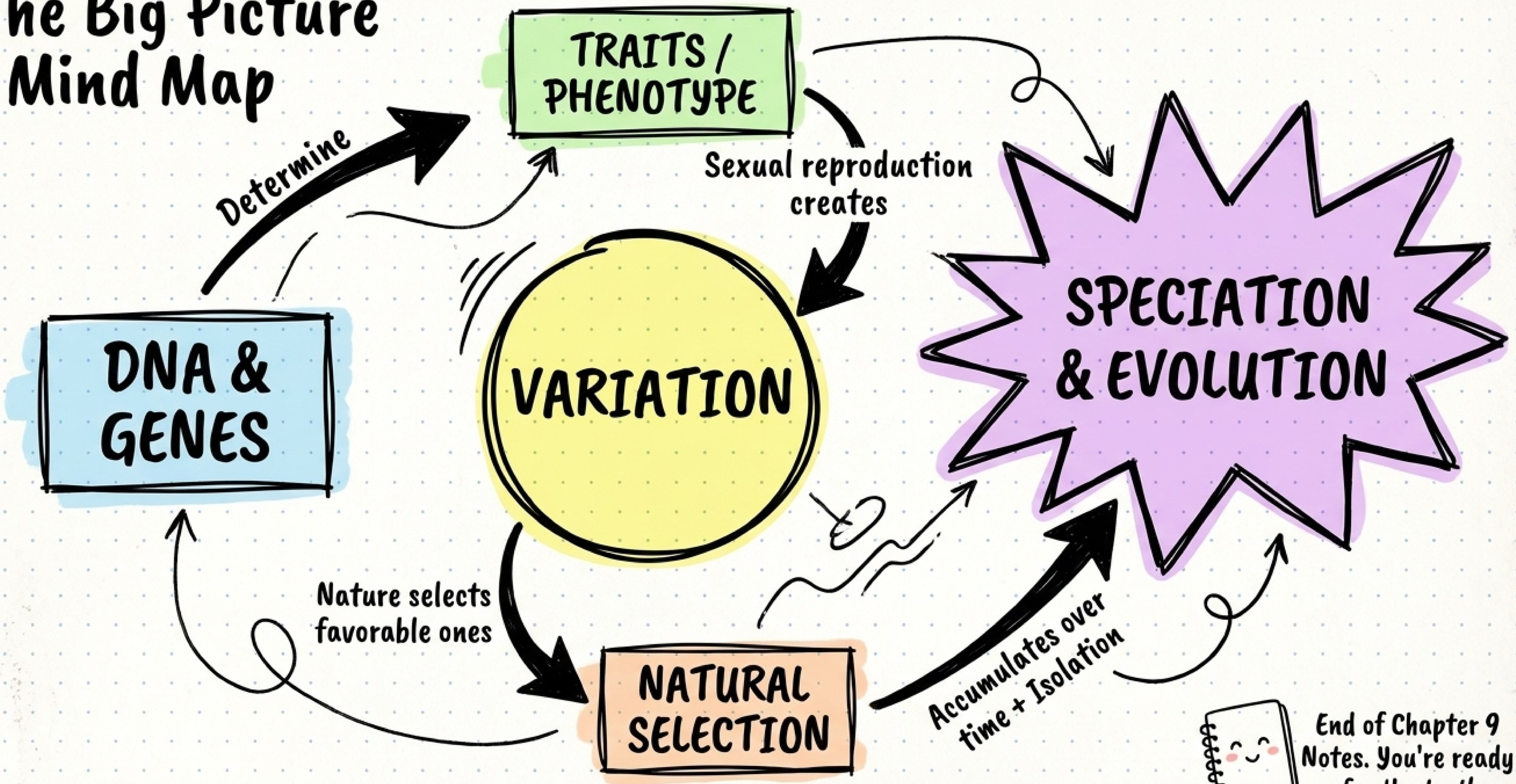
Genetic Drift & Natural Selection

=

Inability to Interbreed.

When the two separated populations change so much they can no longer reproduce with each other, they become entirely new species!

The Big Picture Mind Map



End of Chapter 9 Notes. You're ready for the test!