

# CASE

*Curriculum for Agricultural  
Science Education*

**Principles of Agricultural Science – Animal**

# Genetic Fun-de-Mendels

Unit 7 – Lesson 7.1 A New Pair of Genes

# Gregor Mendel: The Man, the Monk, the Master of Genetics



*Mendel*

Austrian monk in the mid-1800s who conducted experiments with pea plants to discover the principles of heredity.

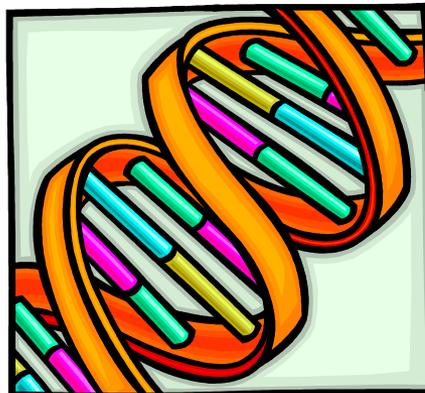
# Gregor Mendel's Studies

His work provided the basis for four laws of inheritance:

- The law of dominance
- The law of segregation
- The law of independent assortment
- The law of unit characters

# What are genes?

- 🧬 A **gene** is the simplest unit of inheritance.
- 🧬 A **gene** influences certain genetic traits in living things.



# What do genes do?

-  **Genes** are carried in the **chromosomes** in the **gametes**.
-  **Genes** are passed from parent to offspring through the process of **meiosis** and **mitosis** during sexual reproduction.
-  The genetic transfer of traits from parent to offspring is called **heredity** or **inheritance**.

# Defining Traits of Living Things

## Genotype

-  **Genotype** is the genetic make-up of living things.
-  Individual organisms of the same **genotype** breed alike.

# Defining Traits of Living Things

## Phenotype

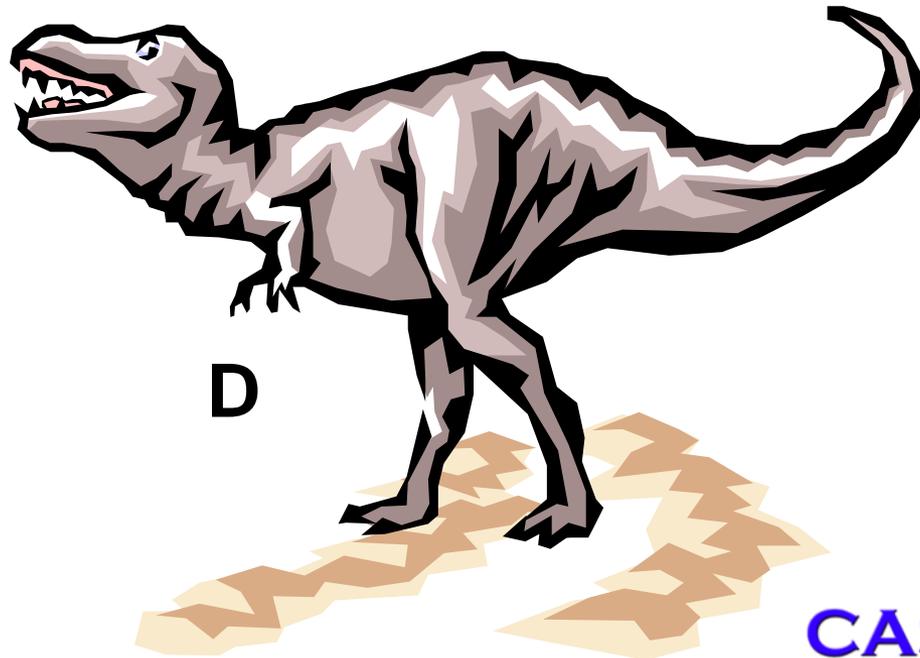
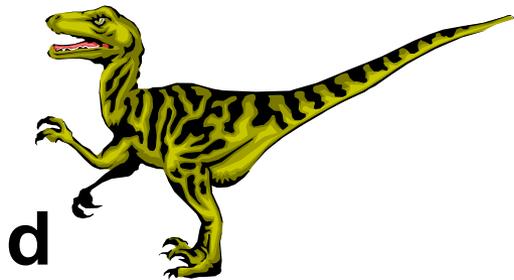
- 🧬 **Phenotype** is the observed characteristics of an individual organism without reference to its genetic make-up.
- 🧬 Individuals of the same **phenotype** look alike but may not breed alike.

# How Heredity is Affected by Genes

- Each characteristic or trait has two genes – one derived from each parent
- If both genes for a characteristic are the same, the animal is **homozygous** for that characteristic.
- If the two genes differ for a given characteristic, the animals are **heterozygous**.

# Which Trait Wins in Heterozygous Pairings?

The law of dominance offered by Mendel states that one gene of the pair may exert its influence over the other.



# Dominance

- 🧬 A **dominant gene** overrides the other gene and is visible in the organism's physical characteristics (i.e., phenotypic characteristics).
- 🧬 This is referred to as a **dominant trait**.

# Recessive

- The other gene partner of heterozygous traits will not be seen in the phenotype.
  - It does still remain in the genotype however
- When crossed with another animal containing the same recessive trait, some offspring may show the recessive characteristic.

# Predicting Offspring

- Each gene is signified by a letter
- Each gene is paired with another – one gene from each parent
- If the letter is capitalized it is a dominant gene
- If the letter is not capitalized it is a recessive gene

# Polled Trait in Herefords

- 🐮 If polled is a dominant trait, it is represented by the letter “P.”
- 🐮 If a parent is homozygous for the genetic traits of polled, the gene pair would be “PP.”
- 🐮 If it is heterozygous for polled traits, the gene pair would be “Pp.”

# Punnett Square

Use a Punnett Square to determine the offspring for two homozygous parents:

		Homozygous Parent	
		<b>P</b>	<b>P</b>
Homozygous Parent	<b>P</b>		
	<b>P</b>		

# Results of Homozygous Pairing

		Homozygous Parent	
		P	P
Homozygous Parent	P	<i>PP</i>	<i>PP</i>
	P	<i>PP</i>	<i>PP</i>

What is the percent chance of offspring that will be polled?

# Let's see how recessive genes reappear...

Use a Punnett Square to determine the offspring for two heterozygous parents:

		Heterozygous Parent	
		<b>P</b>	<b>p</b>
Heterozygous Parent	<b>P</b>		
	<b>p</b>		

# The Results...

		Heterozygous Parent	
		P	p
Heterozygous Parent	P	<i>PP</i>	<i>Pp</i>
	p	<i>Pp</i>	<i>pp</i>

What is the percent chance of offspring that will be polled?

# References



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