Essential Question: How are genes, chromosomes, and heredity "related" to one another?

Standards:

S7L3a. Explain the role of genes and chromosomes in the process of inheriting a specific trait.

Look at photos on the following slides of famous family members.

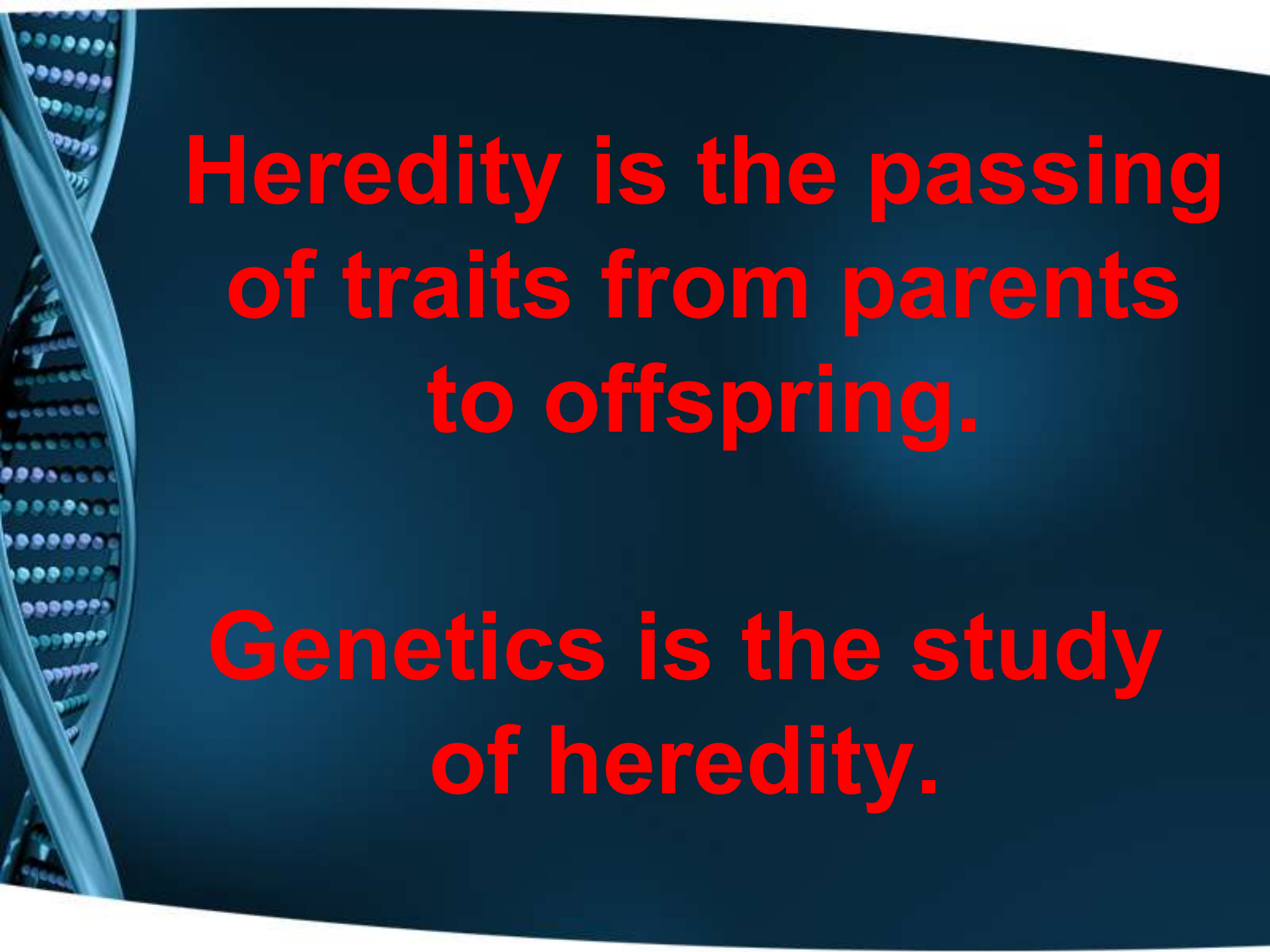
Identify similar characteristics between the children and the parents.

Think of a characteristic that you share with a family member.

Think of a characteristic that you have that none of your family members share.

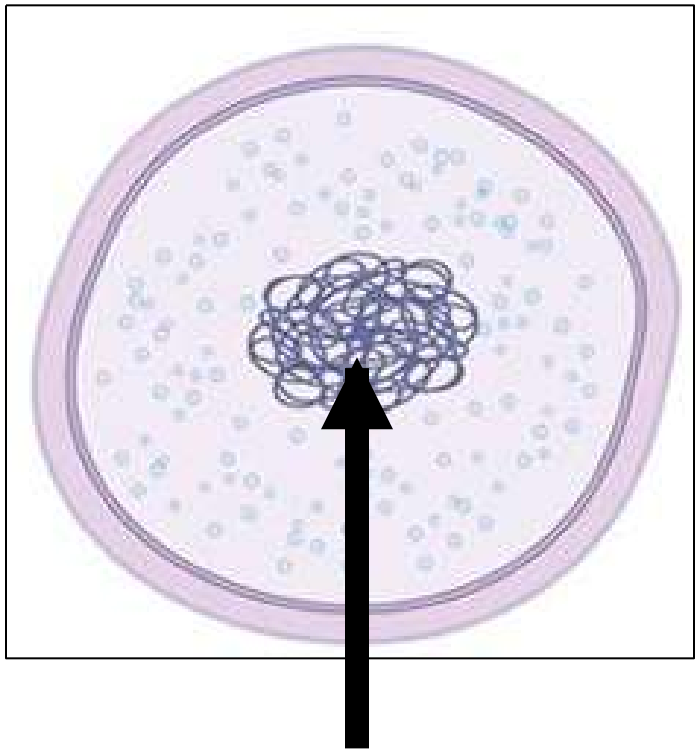
Based on our opening activity, we know that we have characteristics of our parents, yet we are unique individuals. Why is this?

The answer is in the understanding of Heredity.


Heredity is the passing of traits from parents to offspring.
Genetics is the study of heredity.

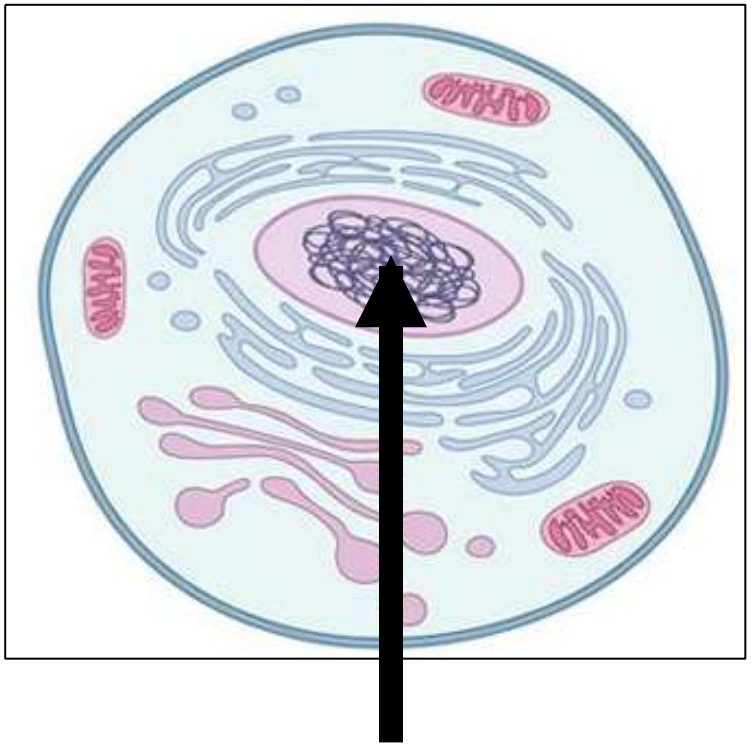
What's the difference between these two cells?

Prokaryote



Genetic Material

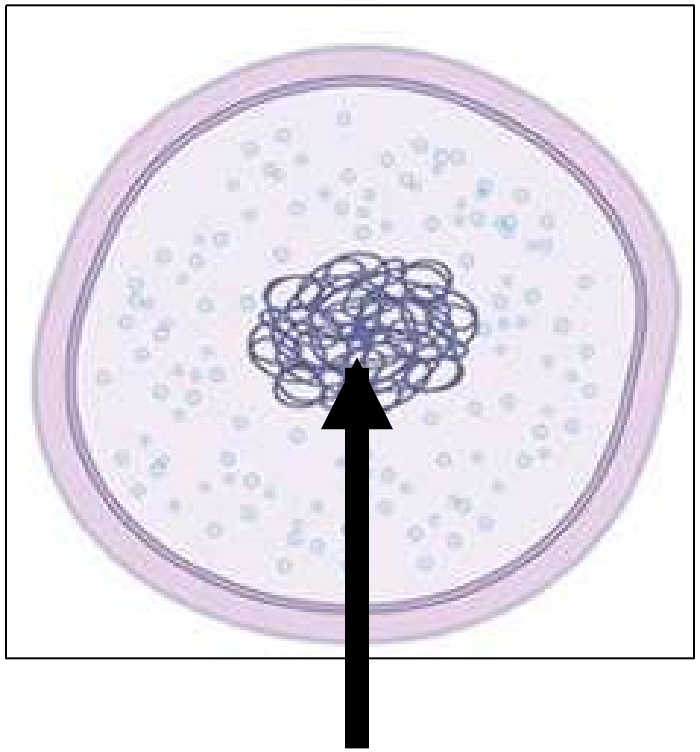
Eukaryote



Genetic Material

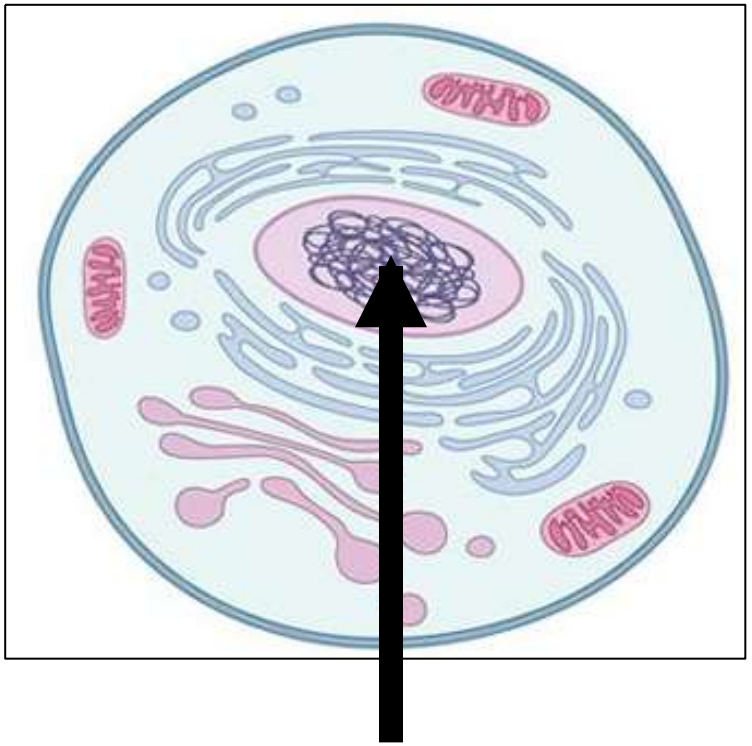
What's the purpose of the genetic material?

Prokaryote



Genetic Material

Eukaryote



Genetic Material

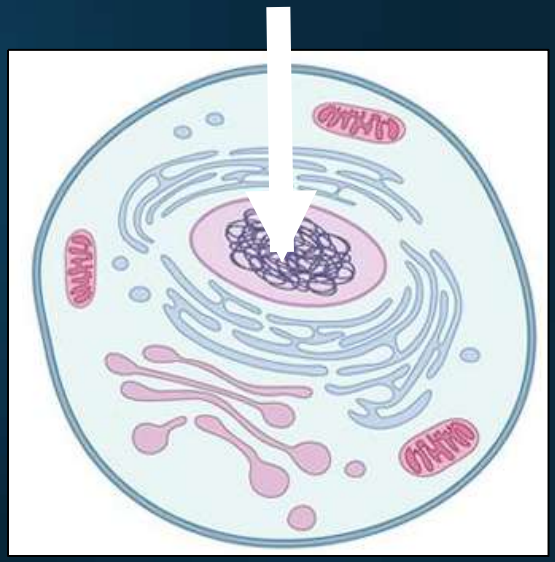
So far, we have discussed genetic material in the nucleus of a cell that makes you unique. Now, we can give the genetic material a name…

DNA

DNA stands for…

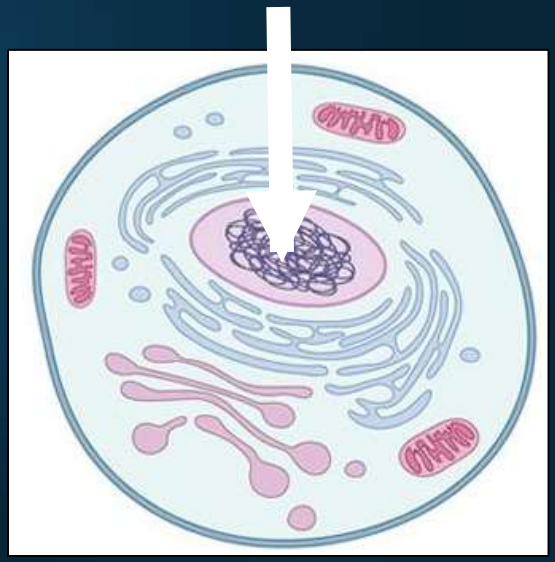
DeoxyriboNucleic Acid

Genetic Material: DNA

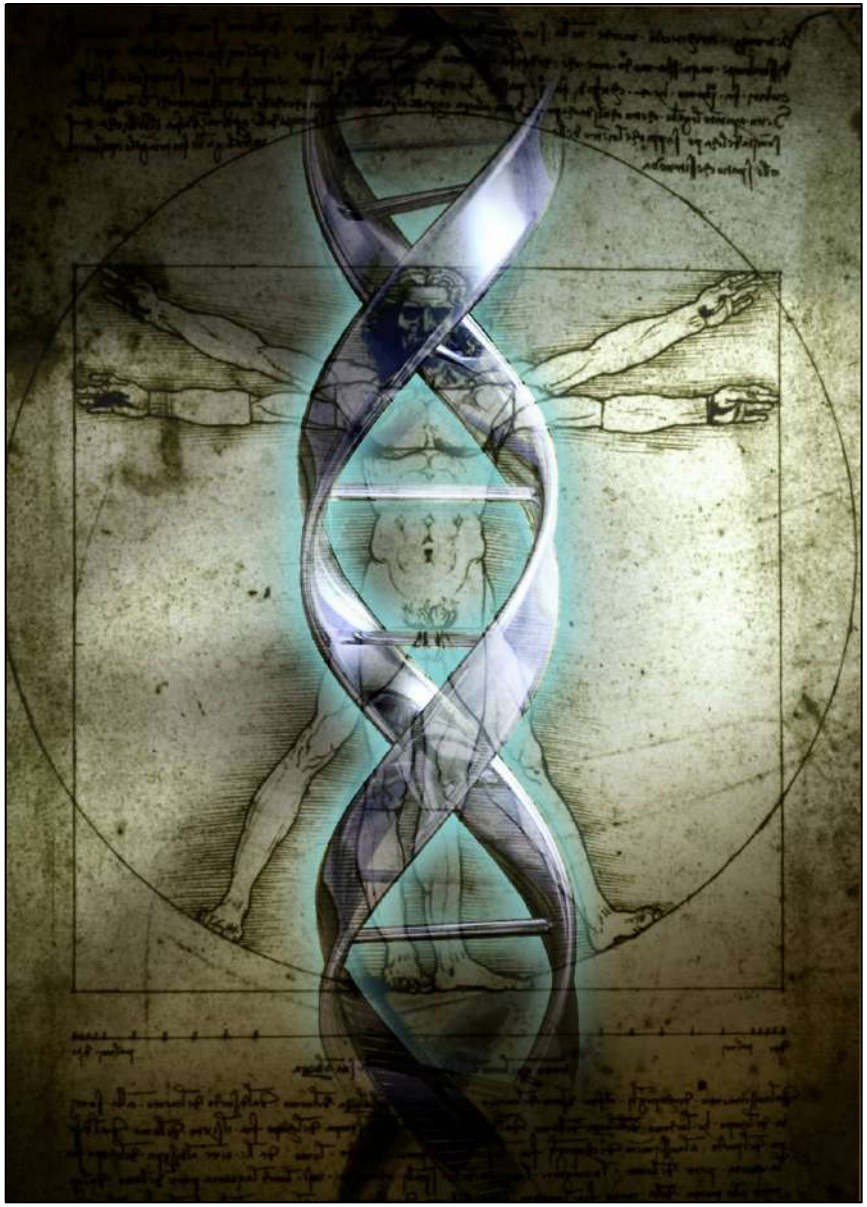


DNA is a long molecule that carries an organisms genetic information (genes)

Genetic Material: DNA

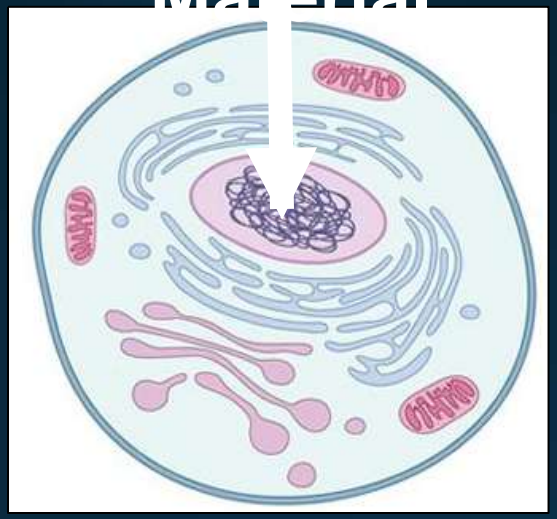


DNA is often referred to as a blueprint because it contains the instructions needed for an organism to grow, maintain itself, and reproduce.



Genetic material (DNA) makes you an individual with a unique combination of characteristics. These characteristics are also known as Traits.

Turn to a seat partner and describe a few Traits that make you different from others.



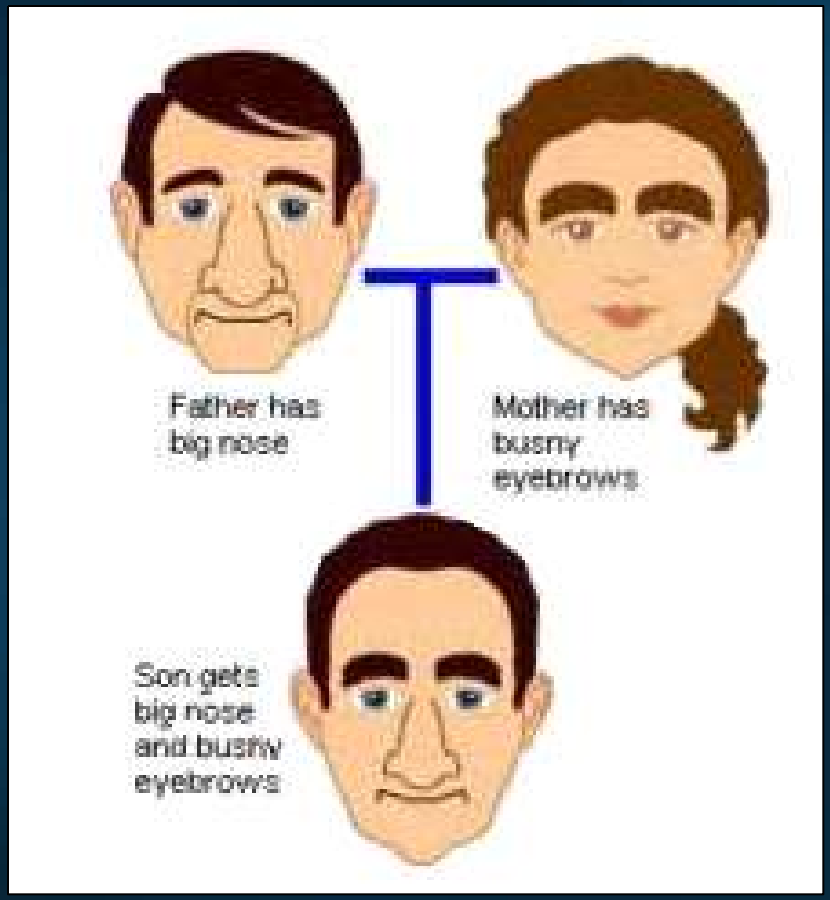
Inherited Traits

- Many of your traits may resemble those your parents have. These characteristics are called inherited traits, like hair color, eye color, and blood type.
- Some traits are acquired, not inherited. Which means the trait is developed during your life. For Example, callouses on your fingers
- Some traits are both inherited and acquired. For example, skin color has both an inherited component and an environmental one.

Inherited Traits

- If a mother works out as a body builder for many years, will her offspring inherit strong muscles? Why or Why Not?
- If a father speaks several languages fluently, will his children be able to understand what he is saying in different languages? Why or Why Not?

Inherited Traits



You inherit traits through sexual reproduction.

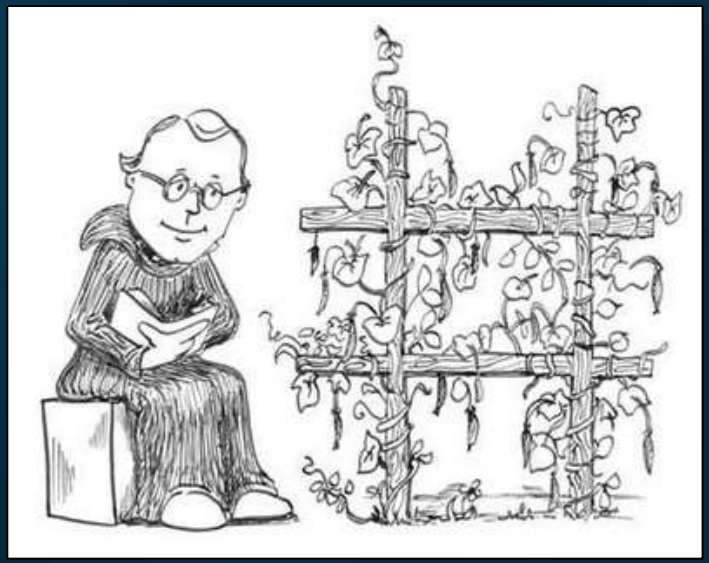
A cell containing genetic material (DNA) from the mother and a cell containing genetic material (DNA) from the father combine into a completely new cell, which becomes the offspring.

Inherited traits are controlled by the structures, materials, and processes you learned about in the previous units.

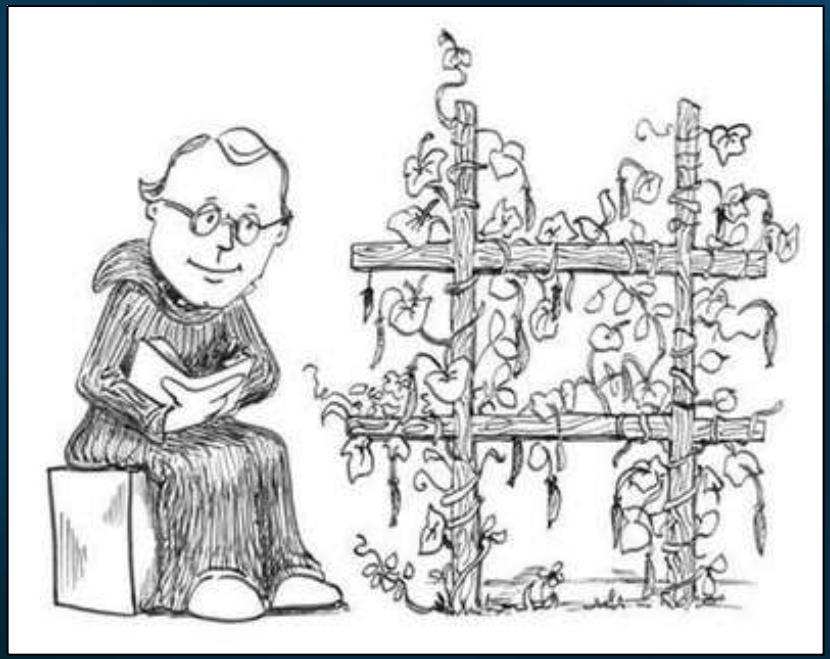
Which structures and processes of the cell do you think are responsible for the inheritance of traits?


An Inventory of Traits Activity [Optional]

Gregor Mendel
(1822-1884)
The Father of Genetics
Austrian Monk
Developed Laws of Inheritance



Mendel discovered **patterns** to **inheritance**. He did this by studying pea plants while living at a monastery.



Between 1856 and 1863, Mendel cultivated and tested thousands of pea plants

He found that the plants' offspring retained traits of the parents

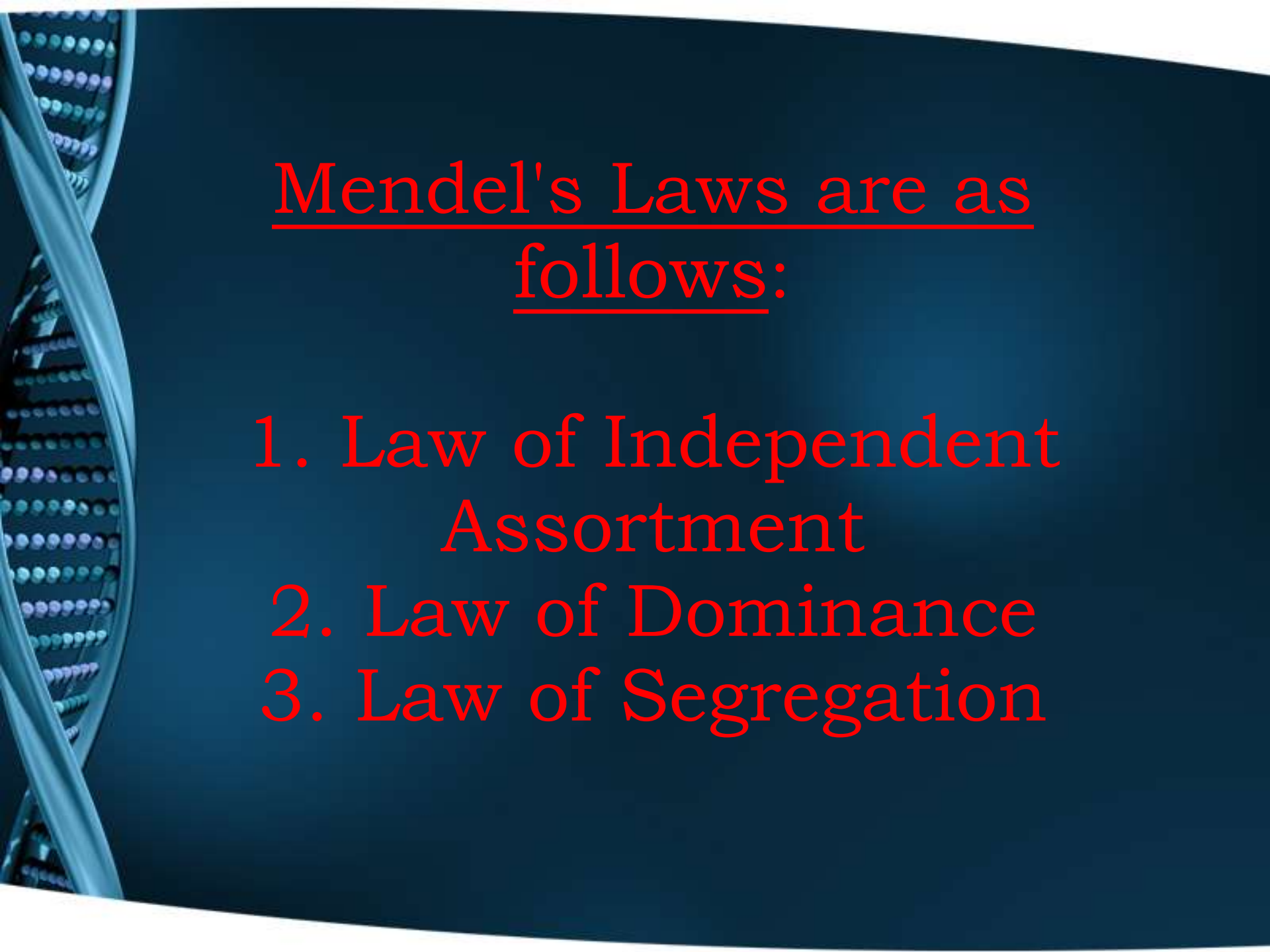
Mendel tested 7 traits:

Flower color
Flower position
Seed color
Seed shape
Pod shape
Pod color
Plant height

Table 14.1 The Results of Mendel's F_1 Crosses for Seven Characters in Pea Plants [true breeding: itself = itself]

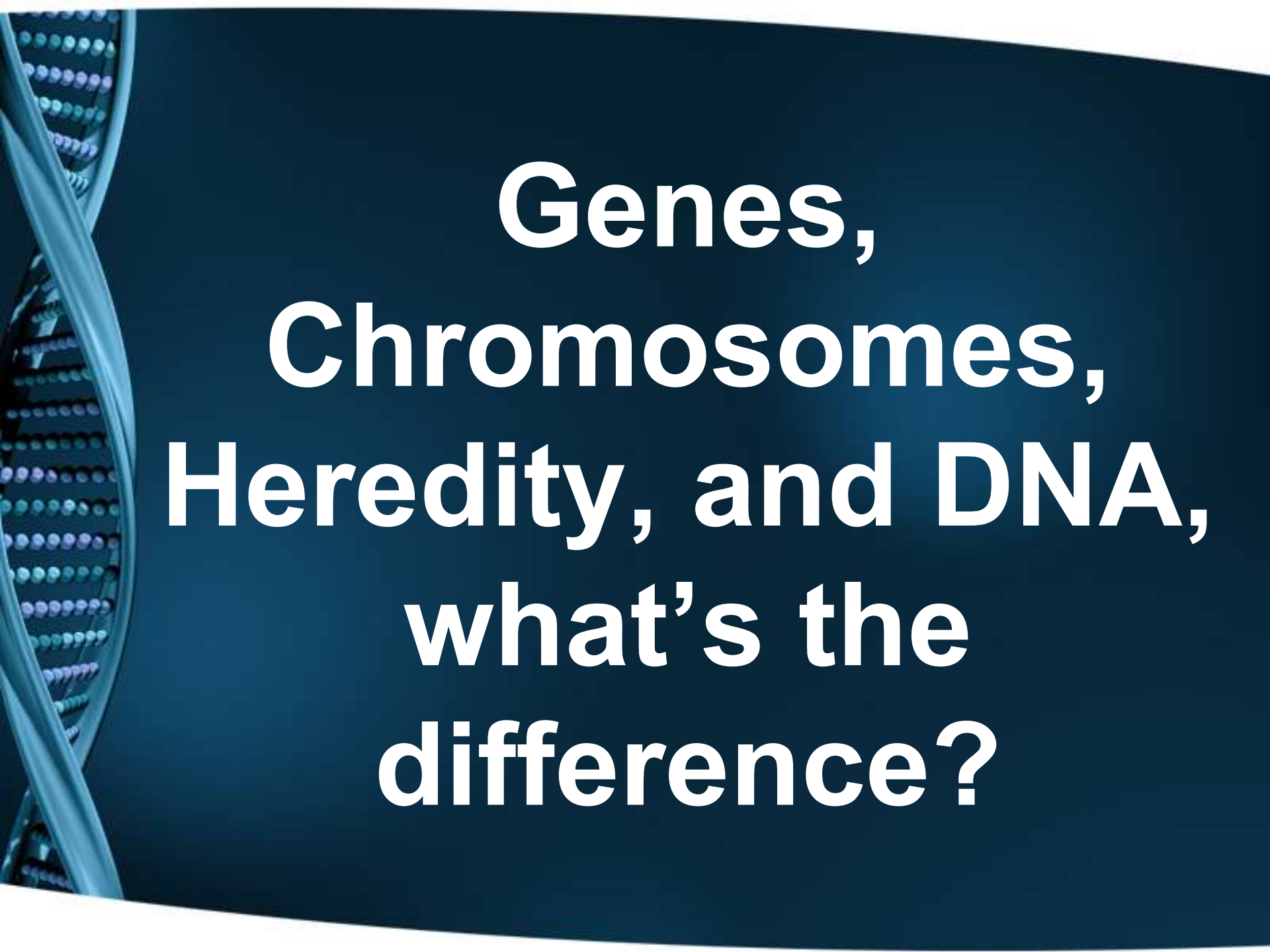
Character	Dominant Trait	×	Recessive Trait	F_2 Generation Dominant:Recessive	Ratio
Flower color	Purple 	×	White 	705:224	3.15:1
Flower position	Axial 	×	Terminal 	651:207	3.14:1
Seed color	Yellow 	×	Green 	6022:2001	3.01:1
Seed shape	Round 	×	Wrinkled 	5474:1850	2.96:1
Pod shape	Inflated 	×	Constricted 	882:299	2.95:1
Pod color	Green 	×	Yellow 	428:152	2.82:1
Stem length	Tall 	×	Dwarf 	787:277	2.84:1


Through Mendel's discoveries, we found out that inherited **traits** (characteristics) are determined by **genes**.

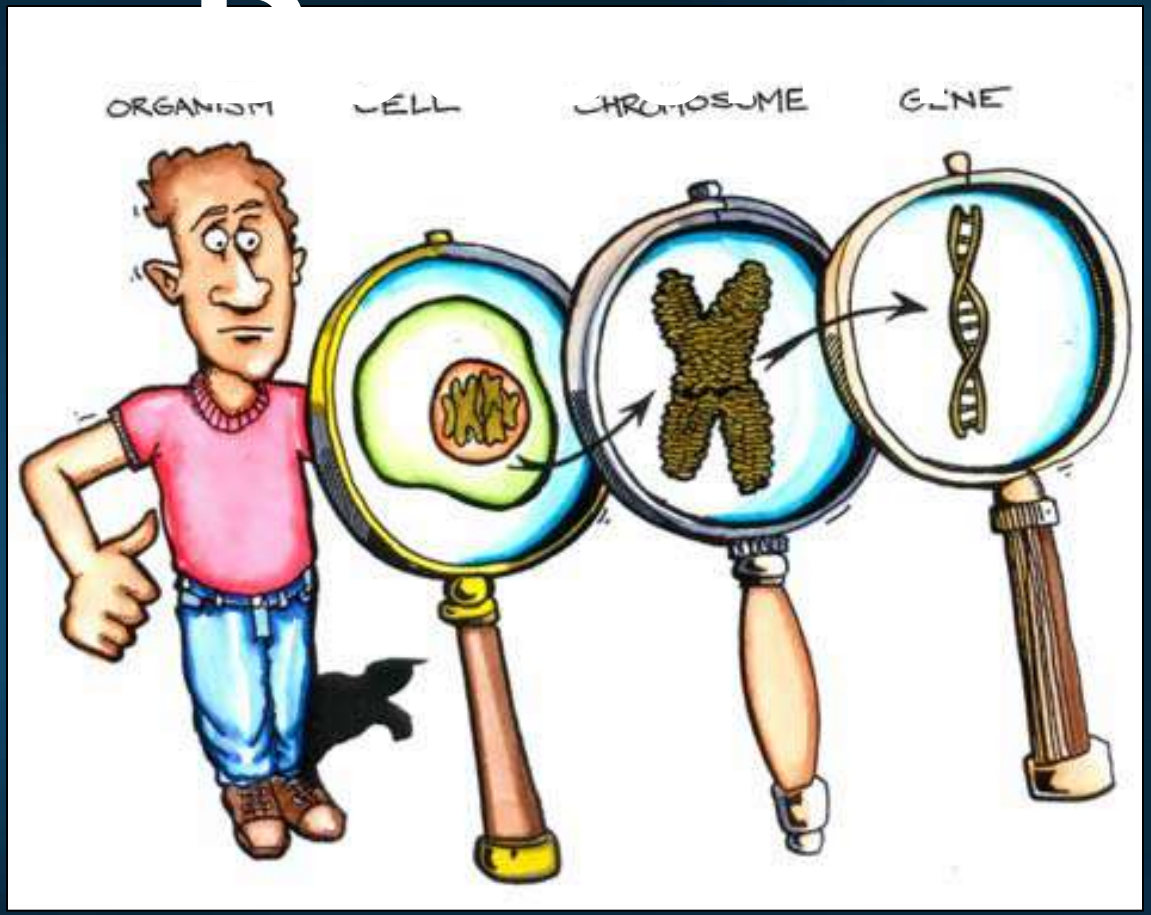

Mendel's Laws are as follows:
1. Law of Independent Assortment
2. Law of Dominance
3. Law of Segregation

Overview of Mendel's Experiment

https://www.youtube.com/watch?v=MehzCxjSE


Genes, Chromosomes, Heredity, and DNA, what's the difference?

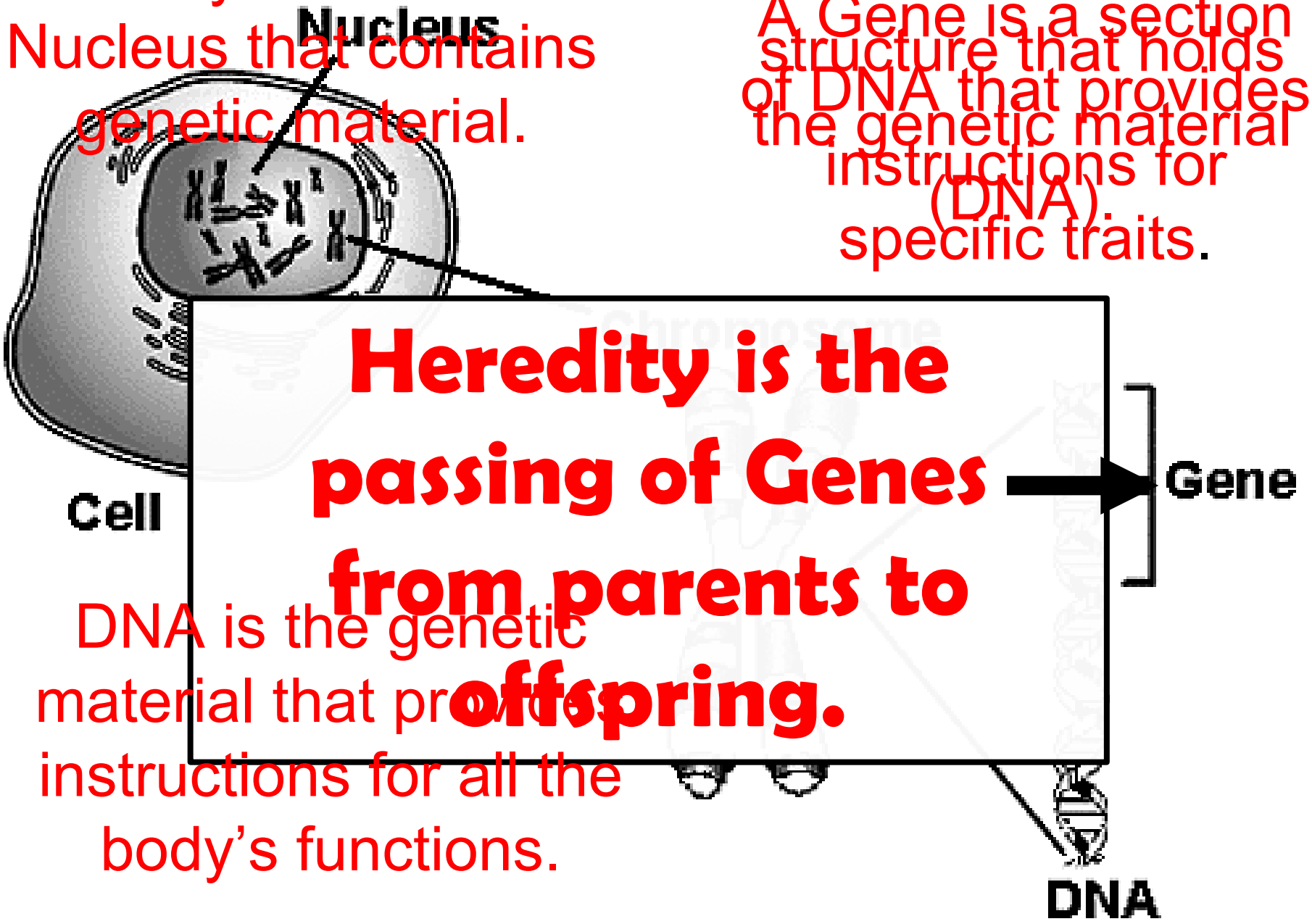
Let's Look



A Eukaryotic cell has a Nucleus that contains genetic material.

A Chromosome is the structure that holds the genetic material (DNA).

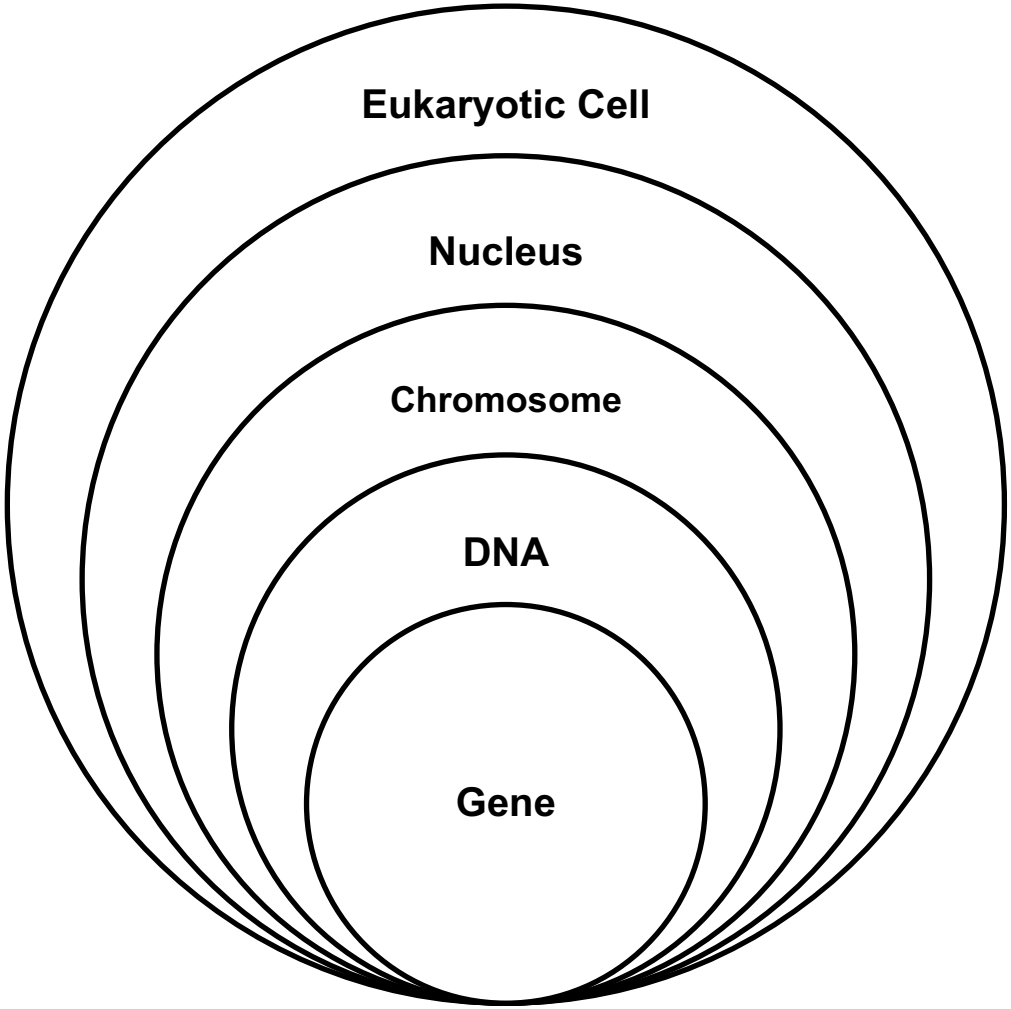
A Gene is a section of DNA that provides instructions for specific traits.



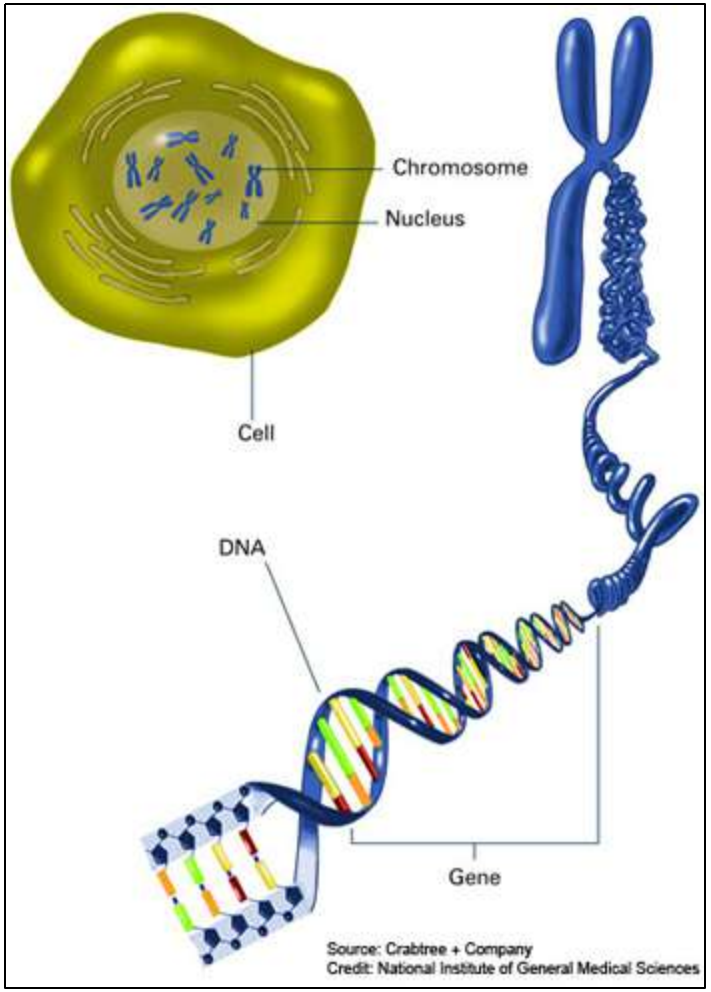
Heredity is the passing of Genes from parents to offspring.

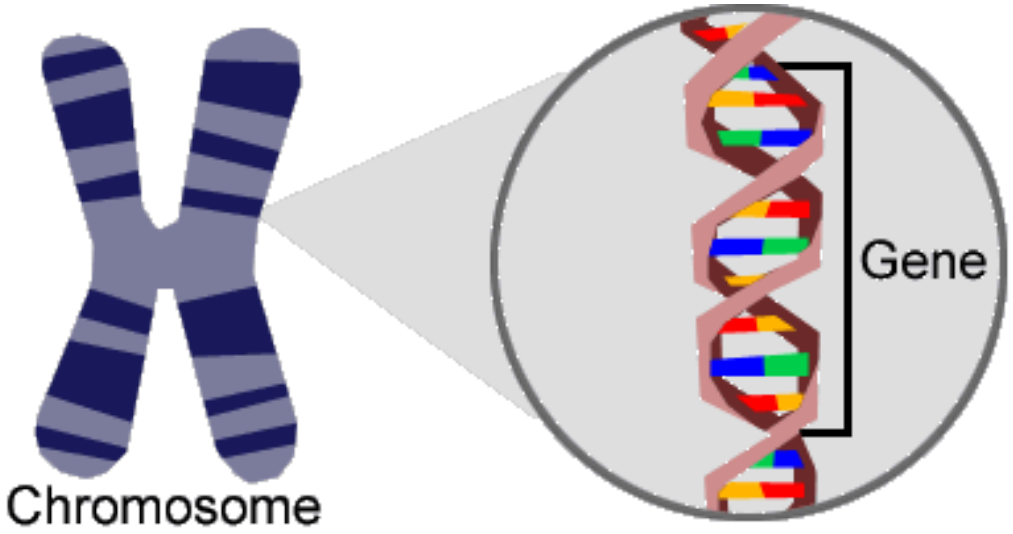
DNA is the genetic material that provides instructions for all the body's functions.

Another Comparison…



Genes, Chromosomes and DNA

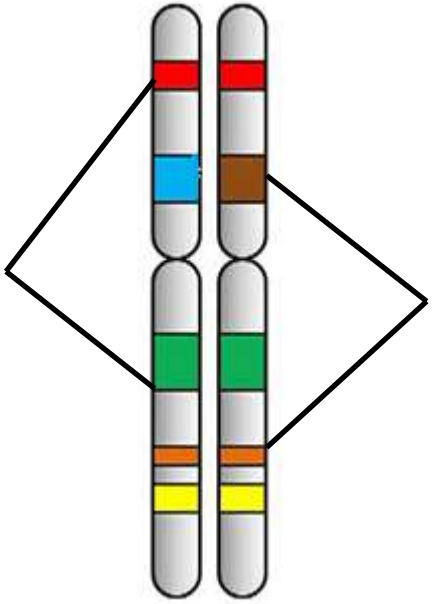




http://learn.genetics.utah.edu/content/chromosomes/intro/

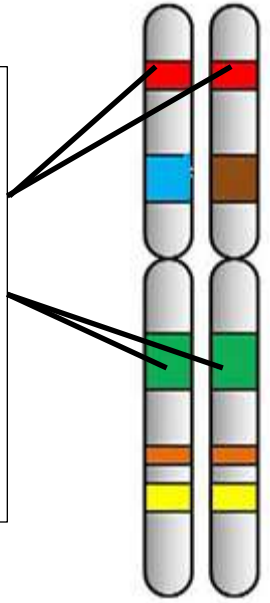
Chromosomes

Genes



Genes

Each set of Genes codes for a different trait



Animations

http://www.yourgenome.org/landing_dgg.shtml

http://learn.genetics.utah.edu/content/molecules/gene/

Study Jams: Heredity

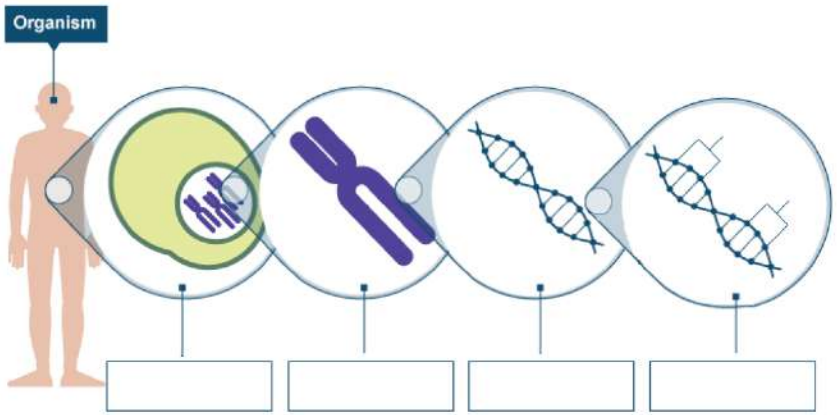
http://studyjams.scholastic.com/studyjams/jams/science/human-body/heredity.htm
[introduces dominant and recessive]


A Recipe for
Traits Activity

Summarizing Strategy:

Genes, Chromosomes and Heredity Summarizer Name _____ Date _____

Label the diagram using the following terms: DNA, cell, gene, and chromosome



Describe the relationship between a gene and a chromosome. _____

_____

Explain how all of this is connected to heredity. _____

_____

_____