6.1
DNA: The Code of Life

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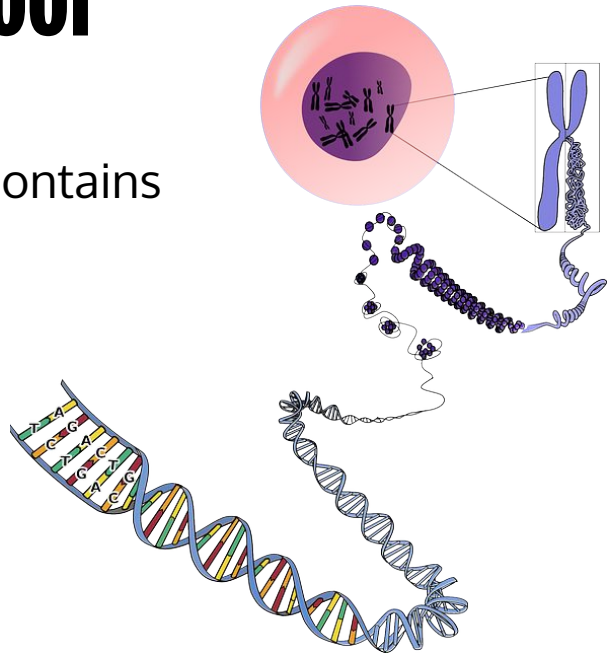
So... DNA is pretty cool



Is it not amazing that every one of your cells contains these codes!?

Some basic facts about DNA:

D *= deoxyribo-*
N *= nucleic-*
A *= acid*

- Double helix structure
  - two strands & curved
  - Made of nucleotides

- Codes for every characteristic, and is passed down from parents

The Discovery of DNA

1869: Friedrich Miescher studied a **compound found in the nucleus** of the cells he studied, and called it **nuclein**
(was nuclein the material that stored / passed on genetic information?)

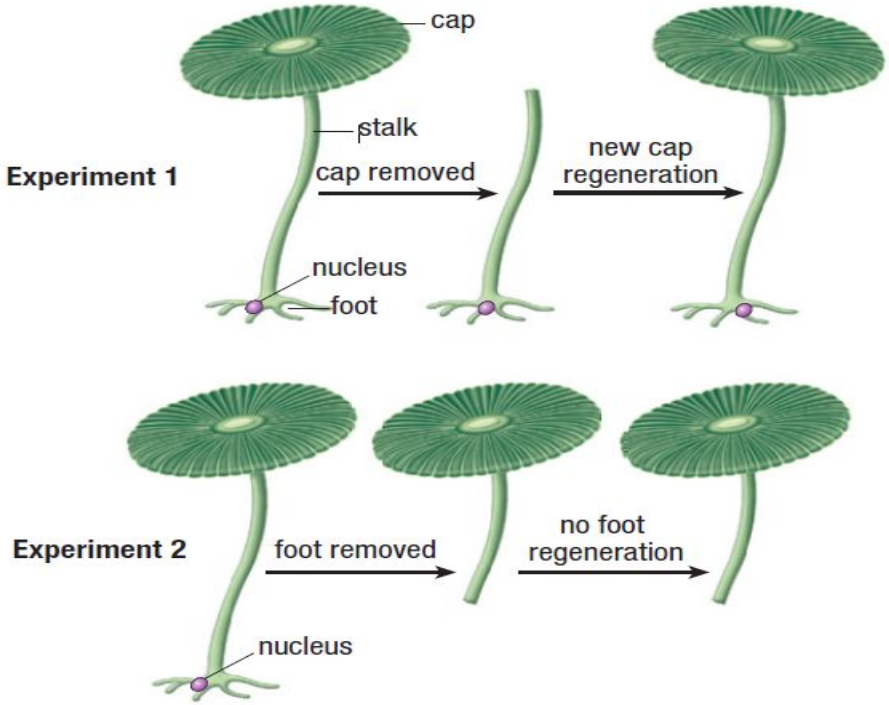
- This is what we now know as **"DNA"**

1920s: Chemical components ***(sugar, phosphate, nitrogenous base)*** **of DNA were discovered** back in the 1920s. At this point, scientists could not prove DNA was responsible for heredity.

Danish Biologist: Hammerling

- **1930s:** although **Hammerling** could not prove what the genetic material was, he discovered that the **nucleus** of a cell **controls the development** of organisms.

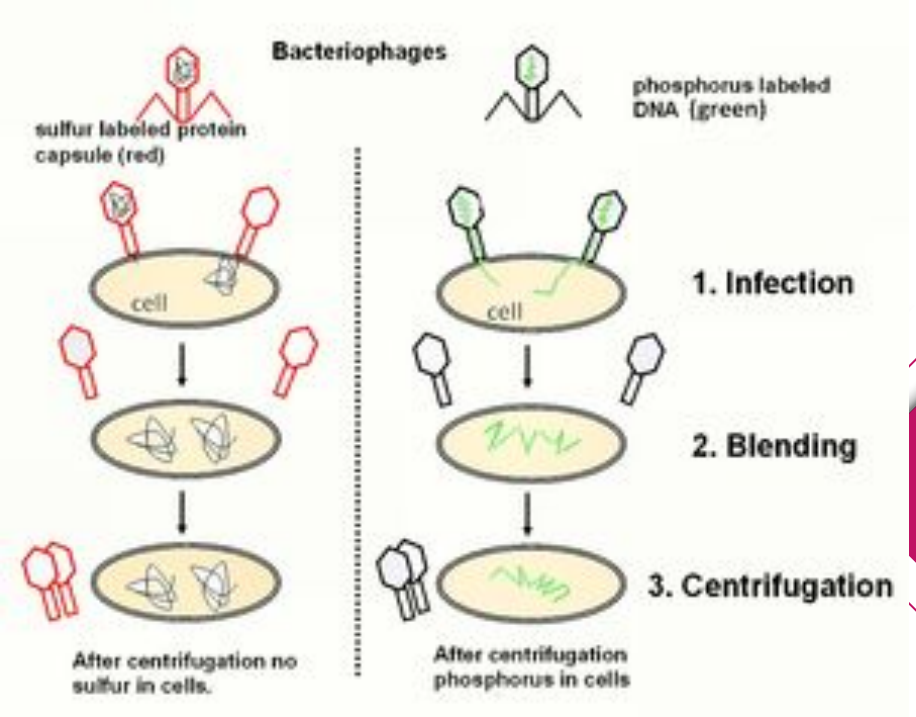
- Diagram: He used Acetabularia, a **single-celled** algae



Hershey and Chase

- **1952: Hershey** and **Chase** used **bacterial viruses** to confirm that DNA was, in fact, the material which contains the **hereditary information** and was stored in the nucleus
- Viruses needed only to inject their DNA into the bacteria to produce more bacteria viruses

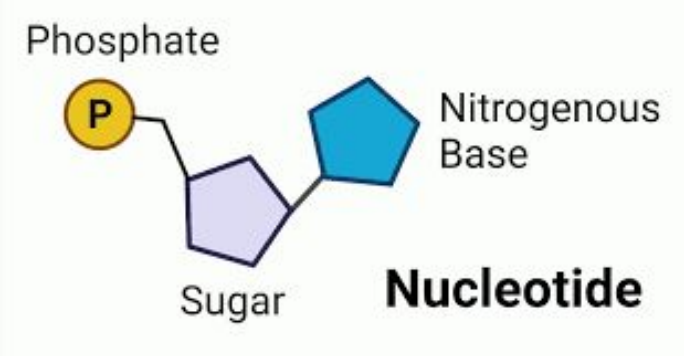
Explanation



The Chemical Composition of DNA

Three components of each DNA molecule

- Deoxyribose (pentose) 5-carbon sugar
- Phosphate **(negative charge)**
- Nitrogen base



- Together these three components create what is called a **"nucleotide"**

- The human genome is made of about **3 billion pairs** of nucleotides!

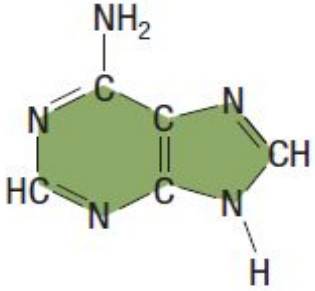
Base Pairs

Pair: A & T
.. makes a word
(apples are in trees)

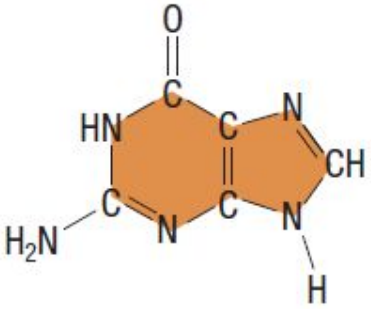
Pair: C & G
.. letters look similar
(car drives in the garage)

TWO RINGS
"giant"

adenine

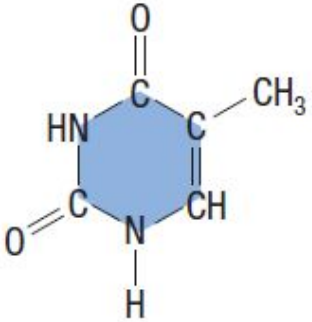


guanine

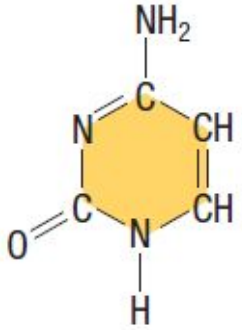


ONE RING
"teency"

thymine



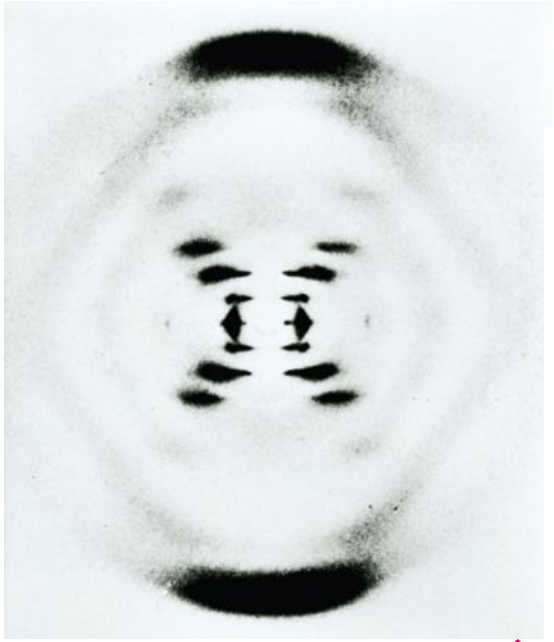
cytosine

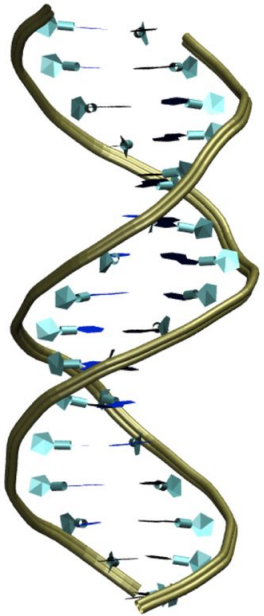


Structure of the DNA Molecule

To understand **how DNA stores and transmits genetic information**, scientists needed to establish the precise **structure** of the molecule.

- In **1951**, researcher **Rosalind Franklin** began to study DNA using **X-ray crystallography**.
- Working together with **Maurice Wilkins**, Franklin determined that DNA molecules form a **helix or corkscrew shape.**





Watson and Crick

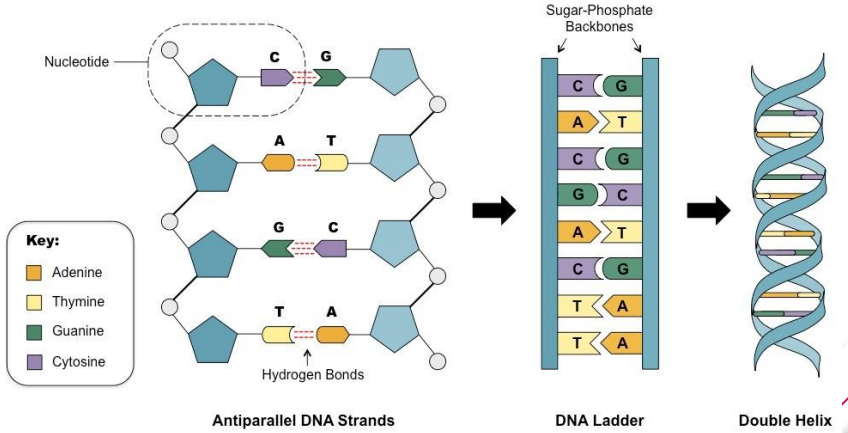
- In **1953**, James Watson and Francis Crick used what they knew about the chemical structure of DNA to build **a model of DNA**.

- Watson and Crick's model showed the molecular structure of DNA to be a **double helix**.

Watson and Crick

Their model accounted for the following information discovered and shared by other scientists:

1. DNA is made of a pentose sugar, a phosphate group, and one of four nitrogenous bases (Levene, 1920s).
2. The proportion of **adenine (A) to thymine (T) is equal.** The proportion of **cytosine (C) to guanine (G)** is equal (Erwin Chargaff , 1940).
3. DNA has the shape of a helix or corkscrew (Franklin and Wilkins, 1951).



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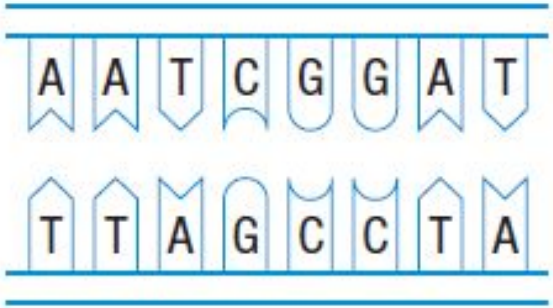

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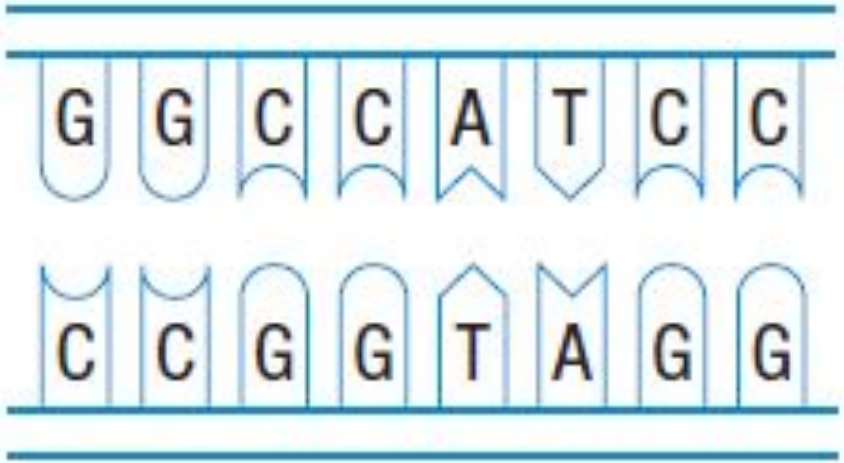

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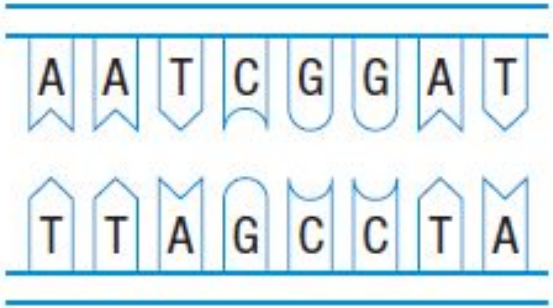

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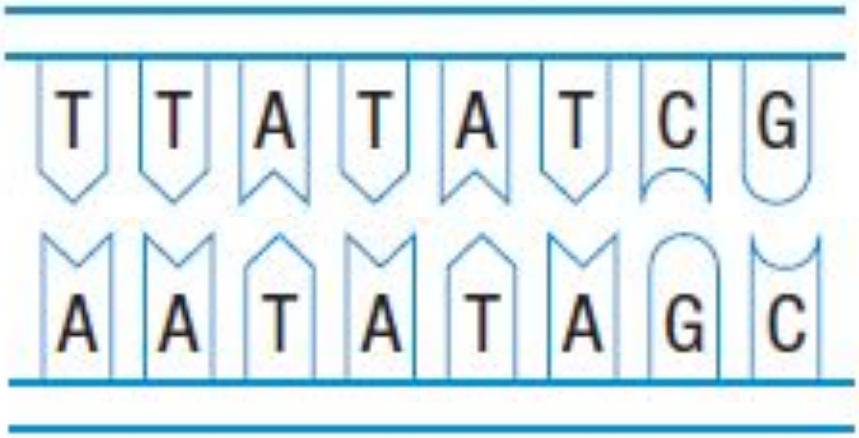

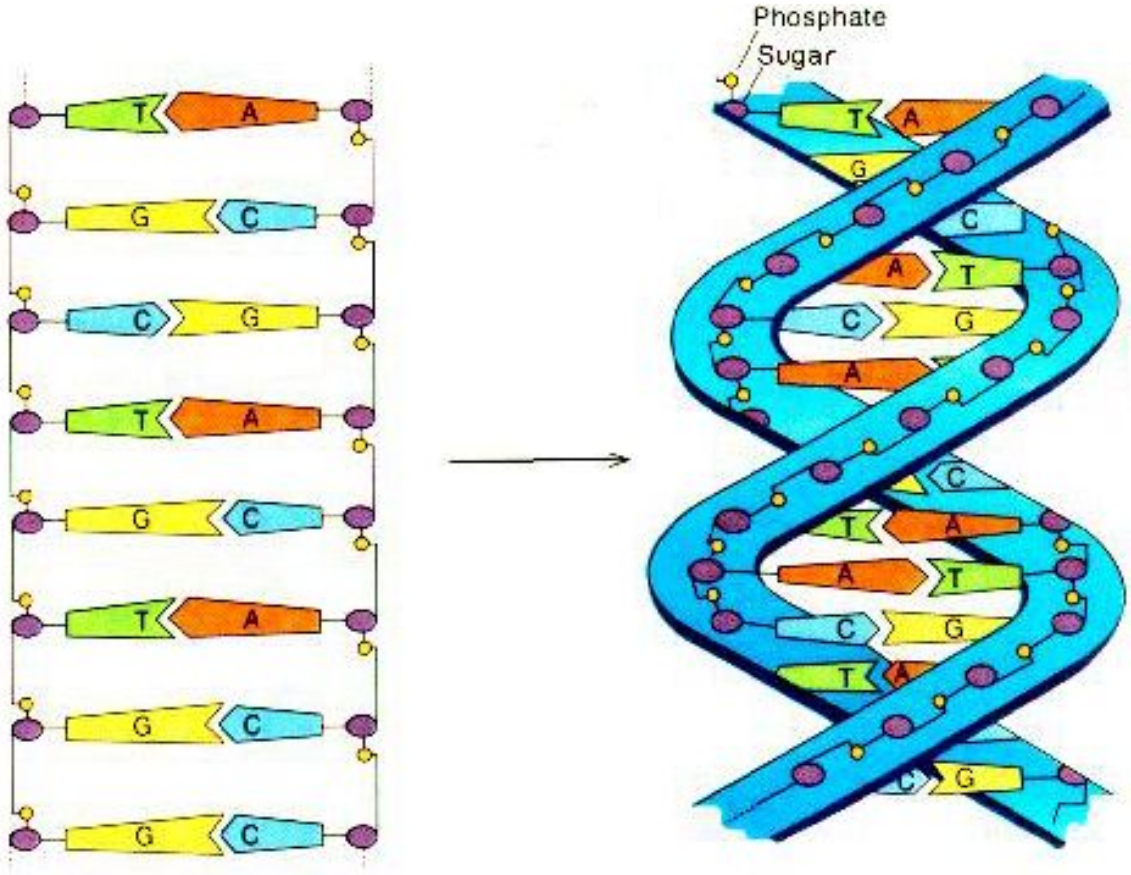

Homework

Construct an origami DNA molecule (pg. 232)

&

pg 233. #2,4 & 5