



# THE HISTORY OF DNA

# OVERVIEW OF THE HISTORY OF DNA RESEARCH



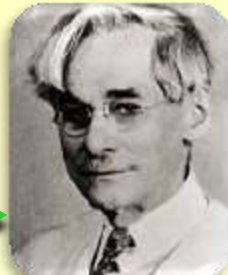
**1869**

Friedrich  
Miescher



**1878**

Albrecht  
Kossel



**1919**

Phoebus  
Levene



**1928**

Frederick  
Griffith



**1943**

Oswald  
Avery



**1950**

Erwin  
Chargaff



**1952**

Martha Chase  
Alfred Hershey



**1952**

Rosalind  
Franklin



**1952**

Maurice  
Wilkins



**1953**

James Watson  
Francis Crick

# Friedrich Miescher (1869)



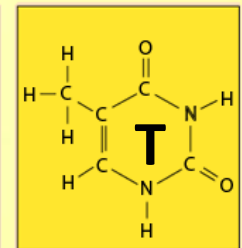
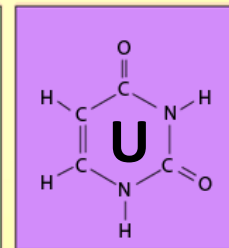
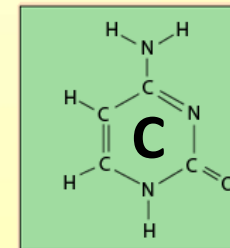
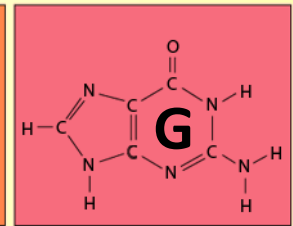
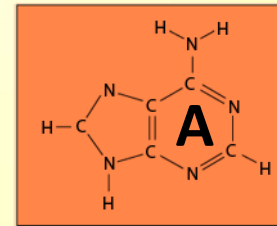
- Discovered a **phosphate-rich** material he called **“nuclein”** in the nuclei of white blood cells that he found in the pus on the bandages of his patients.



# Albrecht Kossel (1878)



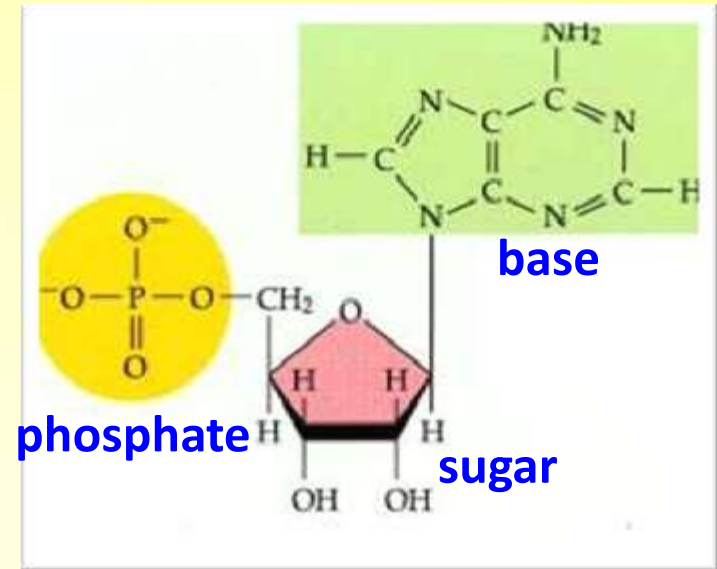
- Isolated the **nucleic acids** apart from the proteins associated with it.
- Discovered that the nucleic acids were made from **5 different subunits**.



## Phoebus Levene (1919)



- Discovered that each subunit of a nucleic acid was made up of a **sugar, base** and **phosphate**.



## Frederick Griffith (1928)



- While working to discover a cure for pneumonia, he discovered the “**Transforming Principle**”.
- He used two strains (rough and smooth) of pneumococcus bacteria to infect mice.



# Frederick Griffith (1928)

## The Griffith Experiments



rough strain  
(not deadly)



Lives!

smooth strain  
(deadly)



Dies!

heat  
killed,  
smooth  
strain



Lives!

rough strain + heat  
killed,  
smooth  
strain



Dies!

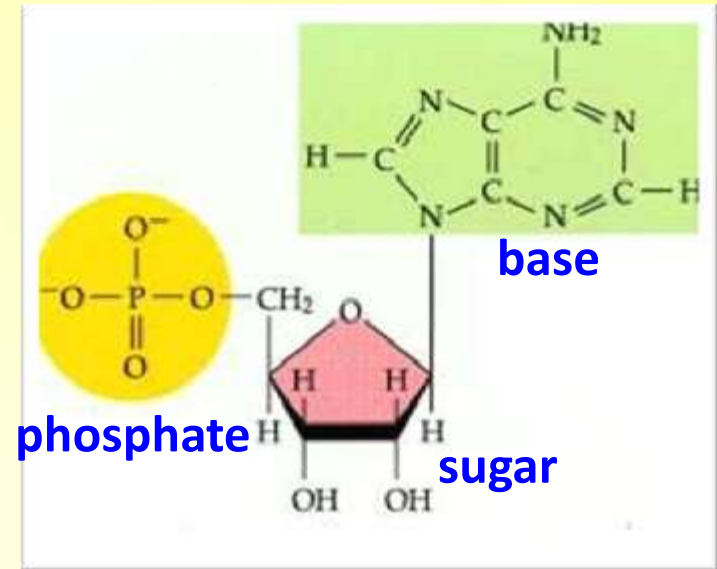
The rough strain was **“transformed”** by something in the heat killed, smooth strain.

He called this the **“Transforming Principle”**.

## Phoebus Levene (1919)



- Discovered that each subunit of a nucleic acid was made up of a **sugar, base** and **phosphate**.



## Frederick Griffith (1928)



- While working to discover a cure for pneumonia, he discovered the “**Transforming Principle**”
- He showed that an inheritance molecule, the “**transforming factor**”, could be passed from one type of bacteria to another.

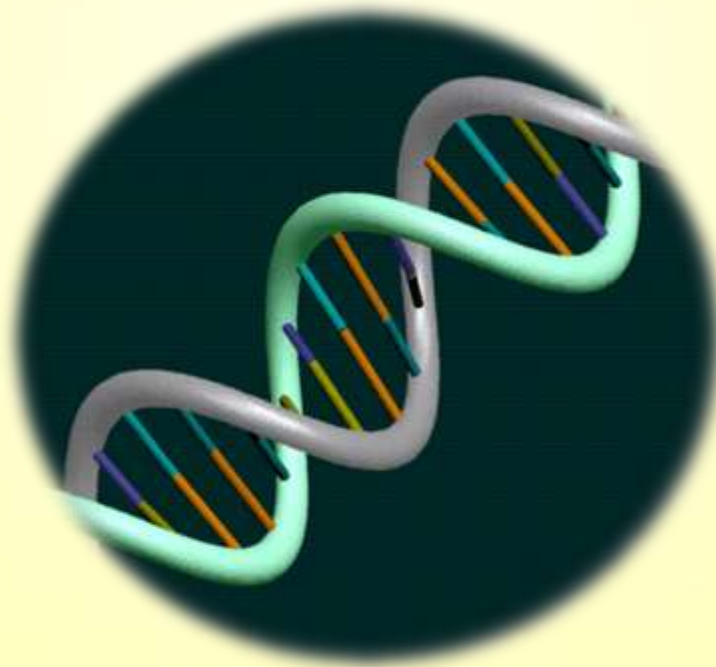
# Oswald Avery (1943)



- He figured out that nucleic acids (DNA) were the “**transforming factors**”, and that DNA was the molecule of genetic inheritance.

Transforming  
Factor

=



=

Molecule of  
Inheritance

# Oswald Avery (1943)

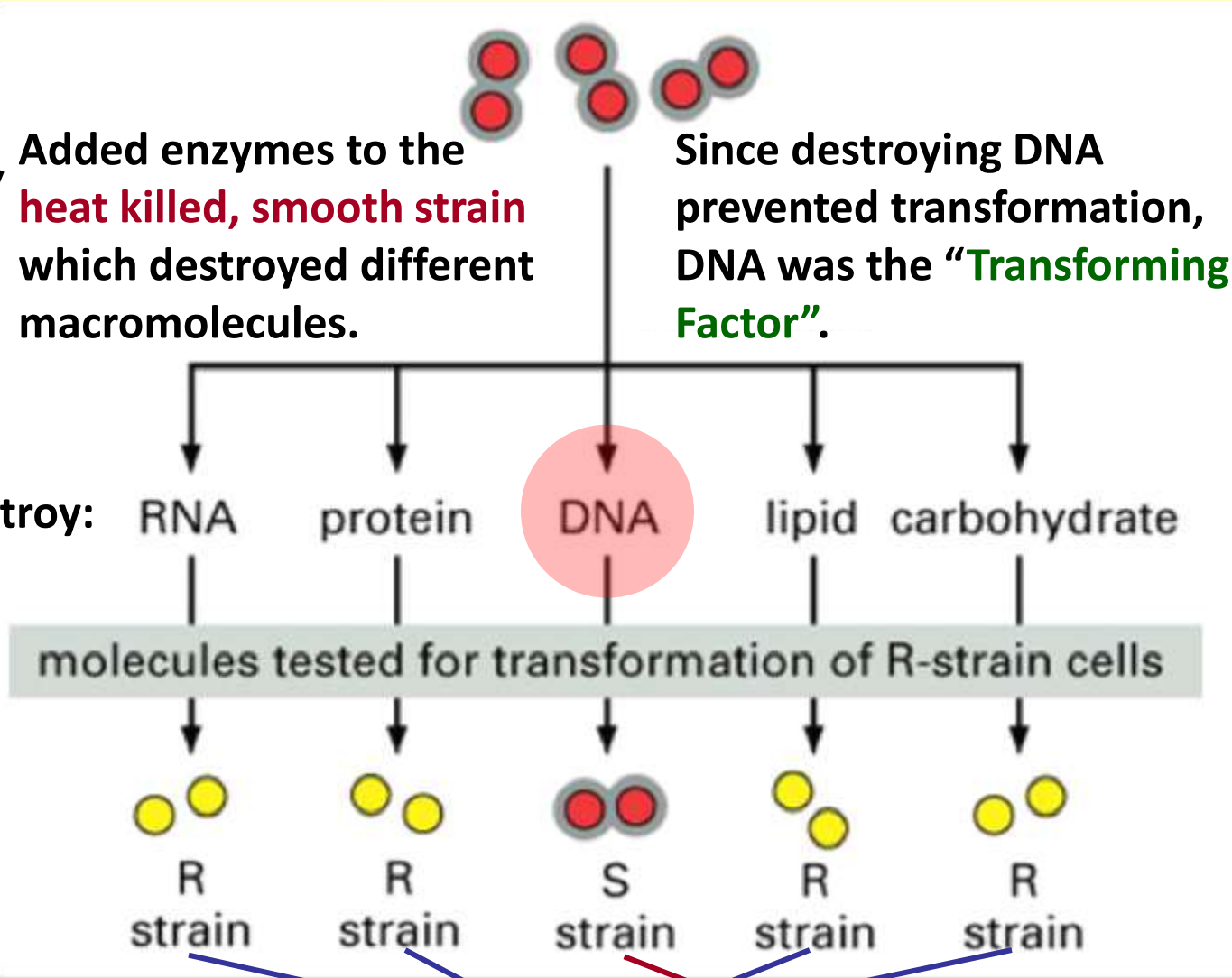
## Avery, McCarty, Macleod Experiments



Added enzymes to the **heat killed, smooth strain** which destroyed different macromolecules.

Since destroying DNA prevented transformation, DNA was the “**Transforming Factor**”.

Enzymes destroy:



Mice lived = transformation    Mice died = no transformation



## Oswald Avery (1943)



- He figured out that nucleic acids (DNA) were the “**transforming factors**”, and that DNA was the molecule of genetic inheritance.

Transforming  
Factor =



= Molecule of  
Inheritance

## Erwin Chargaff (1950)



- He discovered that in every DNA sample, the amount of **Adenine equaled Thymine**, and that the amount of **Guanine equaled Cytosine** – this became known as Chargaff’s Rule

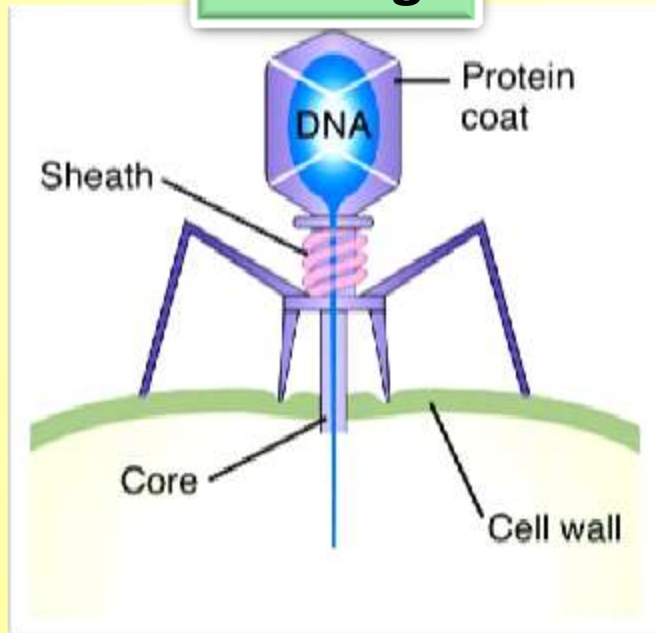
e.g. Humans:    A = 30.9%    T = 29.4%  
                          C = 19.8%    G = 19.8%

# Martha Chase and Alfred Hershey (1952)



- Used bacteria and phages (viruses that infect bacteria) to determine that DNA, not proteins, are the molecules of genetic inheritance in their famous “**blender experiments**”.

T4 Phage



Phages Attacking Bacterium



# Martha Chase and Alfred Hershey (1952)



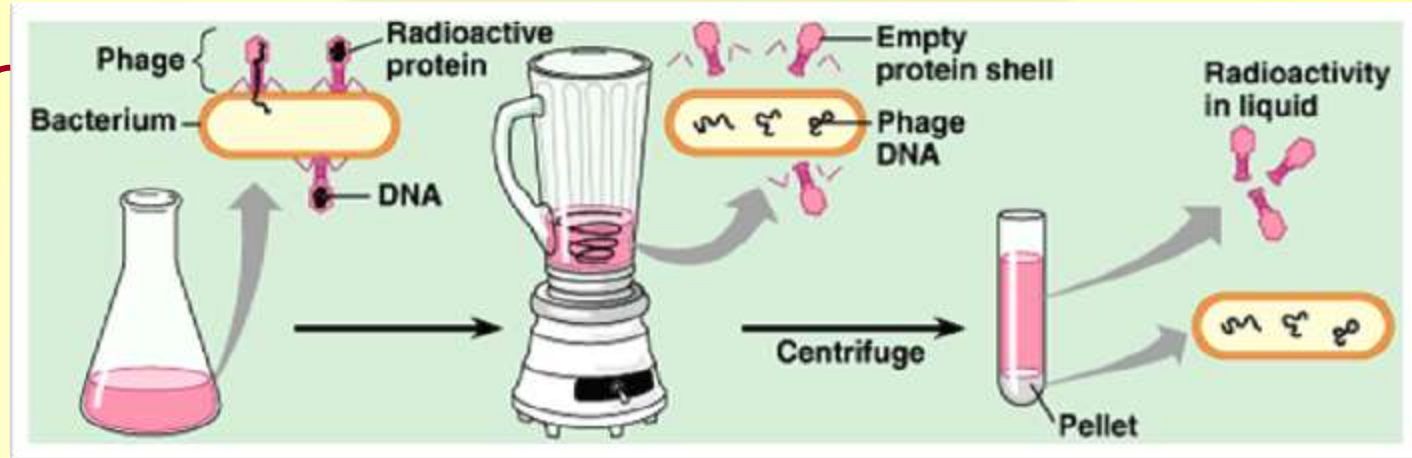
## The Blender Experiments

Phages grown with **radioactive  $^{35}\text{S}$**  which gets added to **proteins**.

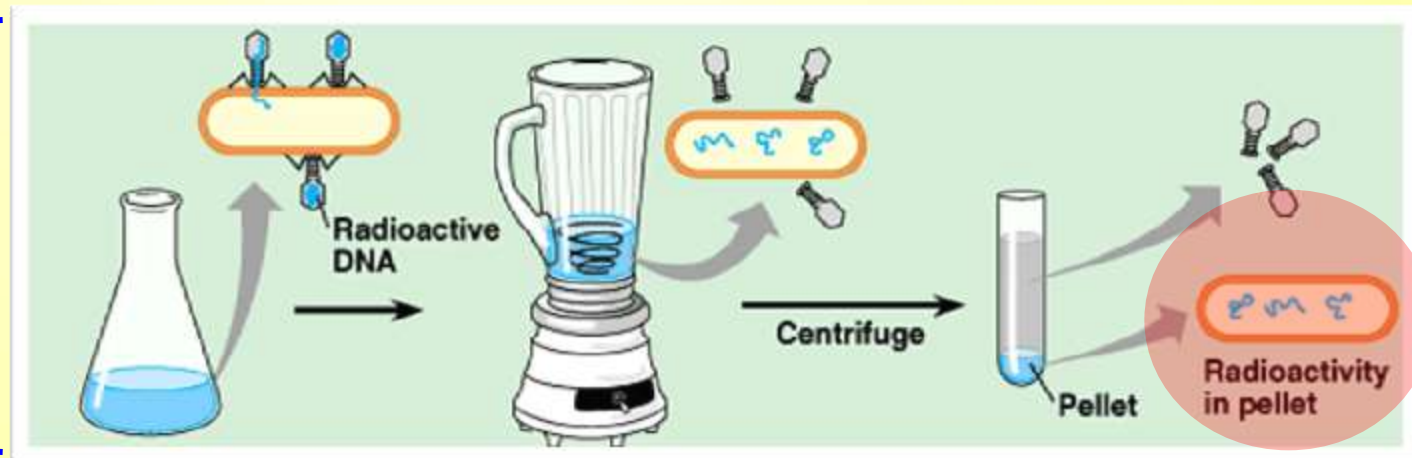
**S** only found in **proteins**.

Phages grown with **radioactive  $^{32}\text{P}$**  which gets added to **nucleic acids**.

**P** only found in **nucleic acids**.



Only the radioactively labelled **nucleic acids** from the phages were found in the bacteria, therefore this was the phage's genetic material.



## Martha Chase and Alfred Hershey (1952)



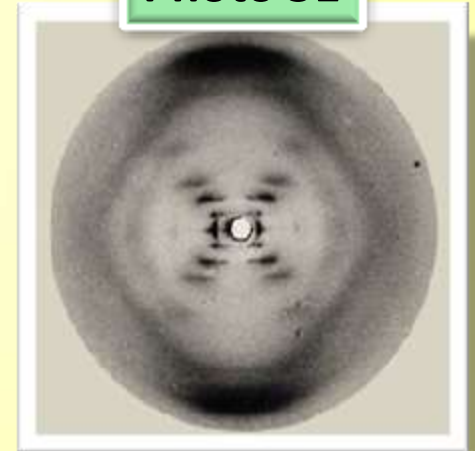
- Used bacteria and phages (viruses that infect bacteria) to determine that DNA, not proteins, are the molecules of genetic inheritance in their famous “**blender experiments**”.

## Rosalind Franklin (1952)



- Crystallized DNA to make an **X-ray diffraction pattern** of it.
- Revealed the **double helix** structure of DNA.
- Died of ovarian cancer at 37, four years before Wilkins, Watson and Crick were awarded the Nobel Prize for the discovery of DNA’s structure.

Photo 51



## Maurice Wilkins (1952)



*Discovery of DNA*



- There was in **rivalry with Franklin** to discover the structure of DNA using X-ray diffraction.
- In **1962** he **won the Nobel Prize** in Physiology and Medicine along with Watson and Crick for discovering the 3D structure of DNA.

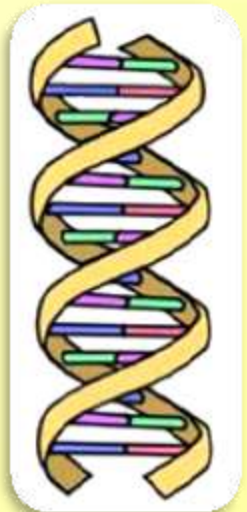
Nobel Prize



## James Watson & Francis Crick (1953)

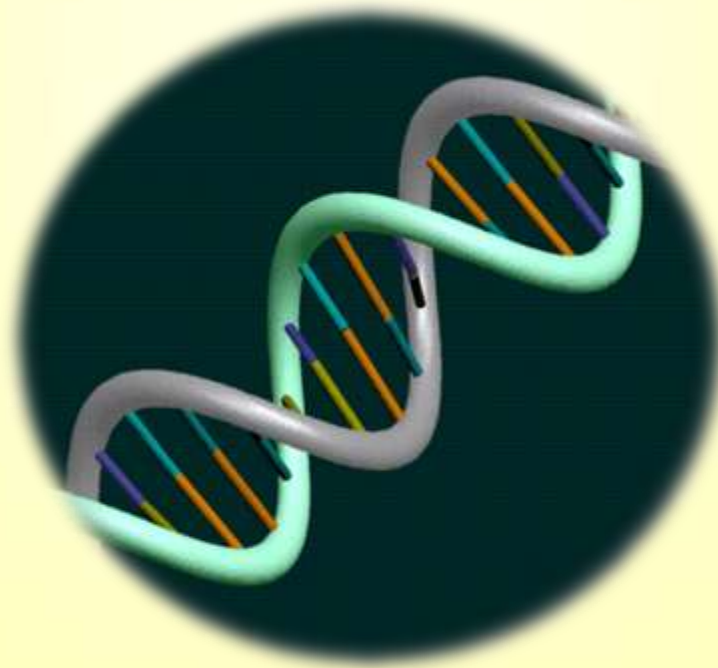


- With the help of Franklin's work, they proposed the **exact 3D structure of the DNA double helix**.
- In **1962** they won the **Nobel Prize** with Wilkins.



## Craig Venter (2000s)

- He led the Human Genome Project and helped sequence all the genes in the human body.



**Open to page 287 (292)  
and read through Chapter 12.1**

**IN YOUR NOTES:**

**→ Add one fact for each scientists**

**→ Or highlight main point for each scientist**



**Created by Anh-Thi Tang – Tangstar Science**

**Copyright © April 2013 Anh-Thi Tang (a.k.a. Tangstar Science)**

All rights reserved by author.

This document is for personal classroom use only.

This entire document, or any parts within, may not be electronically distributed or posted to any website.