Describe the experiments that led to the discovery of DNA as the cell's genetic material.
Explain how Chargaff's rule aided in understanding the structure of DNA
Describe the Watson-Crick model for the structure of DNA, and explain complementary base pairing.
Outline the steps in DNA replication; explain the process of proofreading.
State the evidence for the semi-conservative model of DNA replication.
Outline the historical development of definitions and concepts of the gene, name the workers involved, and briefly discuss their methods.
Distinguish chemically between DNA and varieties of RNA.
Describe the form in which DNA stores hereditary information, and explain how DNA is able to contain so much information.
Define the terms mutation, mutagen, and mutant; explain the importance of their discovery for genetics.
Discuss One gene-one enzyme
Contents

History of Genetic Transformation

Any uptake of genetic information from the external environment into cells that results in the expression of new traits is called **genetic transformation**. This process can occur naturally. Some bacteria are referred to as being "competent" to indicate that they are capable of taking DNA into the cell from the environment. This is referred to as **natural competence**. Bacteria are also capable of receiving DNA through the process of conjugation where plasmids from one bacteria are sent to another through the **conjugation pilus**. Other methods of introduction of foreign DNA include direct injection into the cytosol or through the use of viruses in a process called **transduction**. In eukaryotic cells, we refer to the introduction of DNA as **transfection**.

Frederick Griffith and the Transforming Agent

At the beginning of modern biology, the source of genetic material was not known to be DNA. In fact, many scientists thought DNA was too simple to perform this job. Scientists believed that proteins, with their 20 varied amino acids, were the carriers of genetic information. In an attempt to develop a vaccine for a bacterial induced pneumonia, Frederick Griffith was the first to describe the process of genetic transformation by accident in 1928. Griffith took a virulent strain of bacteria (smooth in appearance) that caused pneumonia and injected them into mice. This would result in death of the mice. He also observed that injection of a rough bacteria did not cause any disease. After heat-killing the smooth bacteria, he discovered that living bacteria of the virulent strain was required for the disease to progress. Finally, he observed that injecting the heat-killed virulent bacteria with living bacteria of the non-virulent strain resulted in pneumonia and death in the mice. From this experiment, a **transforming agent** with the capacity to pass on a trait was found to be within the contents of those dead cells. But no one knew this agent to be DNA at that point.