Commentary

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Technique which has Revolutionized the Field is the Polymerase Chain Reaction

Kate Gordon*

Department of Biochemistry University of Pais Vasco, Bilbao, Spain

***Corresponding author:** Ruolin Wu**,** Department of Biochemistry, University of Pais Vasco Bilbao, Spain, E-mail: gordon_k@gmail.com

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Description

Molecular biology is the branch of biology that seeks to understand the molecular basis of biological activity in and between cells, including molecular synthesis, modification, mechanisms, and interactions. The study of chemical and physical structure of biological macromolecules is known as molecular biology.

Molecular biology was first described as an approach focused on the underpinnings of biological phenomena uncovering the structures of biological molecules as well as their interactions, and how these interactions explain observations of classical biology.

In 1945 the term molecular biology was used by physicist William Astbury. The development in the field of molecular biology happened very late as to understand that the complex system or advantageous approach would be made in simple way of understanding by using bacteria and bacteriophages this organism yields information about basic biological process more readily than animal cell. In 1953 than two young men named Francis Crick and James Watson working at Medical Research Council unit, Cavendish laboratory, Cambridge (now the MRC Laboratory of Molecular Biology), made a double helix model of DNA which changed the whole research scenario they proposed the DNA structure based on previous research done by Rosalind Franklin and Maurice Wilkins then the research lead to finding DNA material in other microorganisms, plants and animals.

Molecular biology is not simply the study of biological molecules and their interactions; rather, it is also collection of techniques developed since the field's genesis which have enabled scientists to learn about molecular processes. One notable technique which has revolutionized the field is the Polymerase Chain Reaction (PCR), which was developed in 1983. PCR is a reaction which amplifies small quantities of DNA, and it is used in many applications across scientific disciplines, as will be discussed later.

The central dogma of molecular biology describes the process in which DNA is transcribed into RNA, which is then translated into protein. Molecular biology also plays a critical role in the understanding of structures, functions, and internal controls within individual cells, all of which can be used to efficiently target new drugs, diagnose disease, and better understand cell physiology. Some clinical research and medical therapies arising from molecular biology are covered under gene therapy whereas the use of molecular biology or molecular cell biology in medicine is now referred to as molecular medicine.

Intersection of Biochemistry and Genetics

Molecular biology sits at the intersection of biochemistry and genetics; as these scientific disciplines emerged and evolved in the 20th century, it became clear that they both sought to determine the molecular mechanisms which underlie vital cellular functions. Advances in molecular biology have been closely related to the development of new technologies and their optimization. Molecular biology has been elucidated by the work of many scientists, and thus the history of the field depends on an understanding of these scientists and their experiments.

It all begins with the phenomenon of transformation in the bacteria, in 1928, Frederick Griffith, observed a phenomenon of transformation from one bacterium to other now known as genetic transformation. At that time, he couldn't explain the phenomenon of transformation. Later in 1944, three scientists Oswald Avery, Colin Macleod and Maclyn McCarty, demonstrated the whole phenomenon of transformation in the bacteria. After, two years in 1930, molecular biology was established as an official branch of science. But the term “molecular biology” wasn't coined until 1938 and that was done by the scientist Warren Weaver, who was working as the director of Natural sciences at Rockefeller Foundation.

From the following experiment it was concluded that DNA is the basic genetic material which caused the genetic changes. Basic composition of the DNA was known that it contains four bases known as adenine, guanine, thymine and cytosine. So, on the bases of the chemical composition and the X-ray crystallography, done by Maurice Wilkins and Rosalind Franklin the DNA structure was proposed by James Watson and Francis Crick. But, before the Watson and Crick proposed the DNA structure, in 1950 Austrian born scientist Erwin Chargaff, proposed the theory rule today known as Chargaff's rule], which stated that the number of Adenine and Thymine and Guanine and Cytosine are in equal proportion.

The Chargaff's Rule

"Chargaff's rule stated that DNA from any species of any organism should have a 1:1 stoichiometric ratio of purine and pyrimidines (i.e., A+G=T+C) and, more specifically, that the amount of guanine should be equal to cytosine and the amount of adenine should be equal to thymine. This pattern is found in both strands of the DNA".

The field of genetics arose as an attempt to understand the molecular mechanisms of genetic inheritance and the structure of a gene. Gregor Mendel pioneered this work in 1866, when he first wrote the laws of genetic inheritance based on his studies of mating crosses in pea plants. One such law of genetic inheritance is the law of segregation, which states that diploid individuals with two alleles for a particular gene will pass one of these alleles to their offspring. Because of his critical work, the study of genetic inheritance is commonly referred to as mendelian genetics.