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DEFINITION

Molecular biology deals with the molecular basis of biological or genetic specificity. It is a programme that searches below the large-scale manifestations of classical biology for the hidden molecular plan. It is a 3-dimensional and structural programme that is concerned not only with form, structure but also with function and generally of cells, organelles and macromolecules of living organisms. It can best be defined as the biochemistry of genes and of the specific products of genes. The products of genes are proteins or enzymes which catalyse biochemical reactions in living cells.

The above definition shows that the three conspicuous components of molecular biology are genetics, biochemistry, and cell biology. We now know in great detail the structure and function of genes in the simple, prokaryotic cells of bacteria. It is also known that a different set of molecular rules governs gene organization and expression in eukaryotic cells. Much is known about the genes and regulatory proteins that control metabolic steps. There has been substantial progress in the study of the structure and function of organelles and of specialized proteins. The main aim of molecular biology is to interpret the properties of the organism by the structure of its constituent molecules. The structure and function of any cell is largely determined by the totality of the protein molecules it contains, and the structure and function of a protein is in turn determined by the particular linear sequence of amino acids subunits from which it is built.

Traditionally, classical geneticists have relied on mutations in specific genes to identify and characterize the gene product. Biochemists have been engaged in learning about the actions of proteins, especially enzymes, from their sequences and 3-dimensional structures. The chief goal of many cell biologists has centred around attempts to find out how specific proteins participate in the construction and operation of specialized cell structures. During the last few decades, the techniques of molecular biology, especially molecular genetics, have catalysed much integration and unification of the above three disciplines. The tools of molecular genetics have been developed to the extent that genes for enzymes, structural proteins, and regulatory proteins can be purified, sequenced, manipulated, reintroduced into individual cells of various kinds, and successfully expressed there as functional proteins.