

Preface

Volume 7 of *Horizons in Biochemistry and Biophysics* is completely devoted to gene structure and expression. Many books on this subject have been published in the past. Most of these are highly specialized and not in the first place directed to the interested colleague or student not yet involved in this field of science. Since *Horizons in Biochemistry and Biophysics* primarily aim to reach this group of scientists, the editors thought it useful to bring together some information concerning topics, which at first glance may appear rather distant, but which are all pertinent to the fascinating biological process of the flow of genetic information from the carrier of this information, the DNA, to the final functionally active gene products, the proteins. In this volume emphasis is put on the eukaryotic cell. An exception is made for the two chapters dealing with the ribosomal RNAs and proteins. This choice was made on the one hand because as yet much more relevant information is available for bacterial ribosomes than for eukaryotic cytoplasmic ribosomes and on the other hand since the observations most likely allow, at least to a certain degree, extrapolation to the latter type of ribosomes.

The chapters 1 and 2 deal with the structure and function of nucleosomes and chromatin, with the role of histones and with the possible mechanisms of activation for replication and transcription and of the selectivity of the information retrieval. The structure and function of ribosomal RNA and ribosomal proteins are described in the chapters 3 and 4. From sequence analysis quite detailed information on the various ribosomal building blocks is available and the way to the integration of this knowledge as to understand the complete architecture and functioning of the ribosomes in protein synthesis, seems open now. At the level of initiation of protein synthesis good progress has been made with respect to the sequential reactions of the various factors and the regulatory steps (chapter 5).

The major issues in eukaryotic gene expression concern the regulatory mechanisms. Of course also bacteria need their regulation processes, but the demands of eukaryotic cells, especially of multicellular organisms with different cell types and tissues, are much stronger. Firstly because of the considerable compartmentation of these cells and the presence of two (the nucleocytoplasmic and mitochondrial), in plants even three (also the plastidic) genetic systems. Secondly because of the high degree of differentiation of the various cell types in higher organisms. Seven chapters are dealing with various aspects of this regulatory processes. They do not give the final words on either of the topics treated, but they point to the problems, develop the possible approaches to tackle the various problems and summarize the observations and facts gathered so far. So at the end it is hoped that a clear picture has emerged, showing the needs for further research at the one side and a better understanding of the complexity of the overall process of gene expression at the other side.

The transport of proteins from the sites of genetic expression to their sites of functional expression is discussed in chapter 6. The many different membranes, each surrounding specific compartments of the cell, put strong barriers to many molecules, especially macromolecules like proteins. None the less there has to be a vivid protein traffic within the cell to enable the proteins to function properly. Besides via signal peptides, other conformational properties and thermodynamic conditions may play a role in this transport circuit.

As an example of differential expression of genes, hormonal regulation is the subject of chapter 7. It is well recognized these days that information about the signals on RNA and DNA responsible for differential expression must reside in specific base sequences. To analyse these sequences one may use the recombinant DNA technique. For this reason chapter 8 dealing with the strategies for optimizing foreign gene expression in *E. coli* is included.

The chapters 9 to 12 are focusing on various aspects of the biogenesis of mitochondria. The interplay between the different genetic systems in one cell is discussed for mitochondria. The type of problems seen in this context and the needs for concerted action of these two systems are essentially similar, although different in details for plastids.

The description of the mosaic genes of mitochondria has a more general range as well. Also many nuclear genes are mosaic and need proper processing of the primary transcripts. The way this processing is accomplished may be different in detail again but not in essence. The assembly of the mitochondrial proteins is rather well documented and adds further information to the phenomena described in chapter 6. Finally the non-universality of the genetic code is an unexpected finding, but interesting especially from an evolutionary point of view.

A. M. Kroon
F. Palmieri
E. Quagliariello