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Towards the frontiers of modern biology

(Preface)

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Since the present issue, *Acta morphologica* of the Bulgarian Academy of Sciences is renamed *Acta cytobiologica et morphologica.* The decision was taken unanimously by the Scientific Council of the Institute of Cell Biology and Morphology at the Bulgarian Academy of Sciences. This decision reflects both the changes in the trends of development of modern biology and the efforts of our Institute to keep in pace with this development.

Biological science entered the 20th century solidly rooted in the cellular theory of structure, function and pathology of living organisms. Clearly, the organization and comportment of both unicellular and multicellular organisms could not be understood outside the frame of cellular structure. Therefore, the first half of the century witnessed our increasingly deeper understanding of the structural features of different tissues and organs in the highly diversified animal and plant organisms. The structural basis in the differentiation of more than 300 different cell types in mammalian organisms was unravelled and decisive steps were made allowing to outline the subsequent phases in cell differentiation taking place during embryogenesis. On the other hand, the development of new and powerful techniques, cell cultivation and electron microscopy in particular, permitted the elucidation of considerable details in subcellular structure. Moreover, it became possible to link specific functions with a given cell organelle: chromosomes as carriers of genes or mitochondria as the site of respiratory chains and oxidative phosphorylation. New subcellular organelles were discovered: ribosomes, lysosomes and cytoskeleton, etc. Each of these organelles was shown to constitute the structural basis for still further cell functions. In particular, studies on ribosomes and polyribosomes revealed these structures as the site of protein synthesis and their further analysis prepared the fruitful integration with biochemistry and genetics.

For a long time biochemistry has been scoring successes in elucidating the structure and metabolism of relatively simple organic molecules (carbohydrates and lipids) in the early stages and of nucleic acids and proteins during the fruitful 1950s and 1960s. When we understood that the gene is a segment of DNA coding for a specific polypeptide chain along the chain DNA →RNA→protein, and after

the genetic code was deciphered in 1961-1965, biological sciences were ready to enter the era of *molecular biology*.

It is now generally recognized that the advent of *molecular biology* in the second half of the 20th century is the landmark of the modern revolution in biology. For it represents the triumph of a new paradigm in biological sciences: life can be understood in molecular terms. On a philosophical basis, to understand means to know the structure, the function and the history of a given phenomenon. Yet, molecular biology provides just an integrated understanding at the molecular level of the structure, the function and the history (both genetics and evolution) of living cells and organisms. It must be added that for a long time the full cognitive power of molecular biology could be applied solely to bacteria and their viruses. Eukaryotes and multicellular eukaryotes in particular, were too complicated and their molecular genetics practically unexplored. Even the best studied organisms, like *Saccharomyces* and *Drosophila*, were for a long time too difficult to be understood as molecular machines. The breakthrough came in the mid-1970s, when the techniques of gene cloning and gene sequencing were introduced. Since then started the advent of *cell biology*. In my view, cell biology is the integrated understanding of cellular structure, function and genetics at molecular level. This is the basic characteristic which makes cell biology a major step in the ever-expanding field of modern biology.

The historical development of our Institute reflects the advancement of biological sciences and thinking outlined above. Founded in 1953 as an Institute of Morphology by Professor A. I. Hadjiolov, it has probed into different aspects of cellular and tissue organization and structure. Traditionally, the histochemistry of lipids has been at the center of interests of A. I. Hadjiolov and his coworkers. In line with the attempts at a deeper understanding of cell and tissue structure, Professor J. Jordanov introduced new techniques of tissue cultivation, while Dr A. Bojadjieva-Mikhailova pioneered the introduction of electron microscopy techniques in our country. The second director of our Institute, Professor I. Goranov developed further the study of blood tissue and started several studies in immunomorphology. Thus, we reached the presemt-day stage in the development of our Institute, where cell biology is becoming more and more its major area of research. This line of development justified the renaming of the Institute in 1986: Institute of Cell Biology and Morphology. The present issue reflects the attempts to develop some aspects of neurobiology in our Institute. It reflects also the attempts to link our activities with those of many leading laboratories in neurobiology and cell biology. Hopefully, this trend in the development of our journal will be expanded further in order to contribute towards the presently more and more clearly outlined frontiers of modern biology.