

Dear Readers,

This is a special issue of *Biochemistry (Moscow)* describing ideas and results of the study of DNA enzymatic modification (methylation), mainly in eucaryotes. The issue is dedicated to 70-year jubilee of Professor, Corresponding Member of the Russian Academy of Sciences Boris Fedorovich Vanyushin, who is one of the pioneers and World-recognized leaders in the field.

Due to his fundamental works, in particular, it became known and is generally recognized that DNA methylation controls genetic functions in the cell and it plays a crucial role in the manifestation of the key elements of life such as ontogenesis, origin of species, evolution, and aging. In fact, his investigations form the fundamentals of a new science, epigenetics, and they materialized it mainly. Boris Vanyushin discovered new enzymes of DNA methylation and the cellular, subcellular (organelle), and age specificity of genome methylation in plants and animals. He was the first to suggest the concept of DNA methylation as a mechanism of regulation of DNA replication, gene expression, and cell differentiation. He discovered replicative DNA methylation in eucaryotes, detected the multiplicity and different specificity of action of DNA-methyltransferases in normal and malignant cells, and formulated and proved the idea that distortion of DNA methylation leads to cancerous cell transformation. He described a non-enzymatic DNA methylation and proved that DNA methylation is an important mutagenic factor in evolution. Thus, regardless of former skepticism about any possible functional role of this genome modification, now there is no doubt that specific DNA methylation is one of the essential genome modifications without which life is strongly hindered or

even impossible. Therefore, the investigation of DNA methylation draws steadfast attention of many scientists and laboratories throughout the World and it occupies a central position in modern epigenetics research and, in particular, human epigenomics projects.

In this issue you will find excellent reviews of first-rate World-renowned scientists whose personal contributions to deciphering the mechanisms and functional role of DNA methylation are invaluable; they describe here the state, problems, and perspectives of this fascinating area of science that have firmly bound together biochemists and molecular biologists.

From the articles represented here it clearly follows that DNA methylation is only one of the important cell epigenetic signals connected to others including histone modifications (acetylation, methylation, and so on) that altogether finally result in the origin of the unique structure of an active or inactive chromatin. Further investigations of modulations of these peculiar modifications in the chromatin structure will make it possible to understand most clearly the position and role of DNA methylation as well as the fundamental mechanisms of cell genetic functions.

In the year of the 250th anniversary of Moscow State University, 100th anniversary of Academician A. N. Belozersky (an outstanding scientist and founder of the nucleic acid school in Russia), and the 70th birthday of his student Boris Vanyushin, it is especially pleasant to realize that fundamental research in DNA methylation was started not only in Russia, but at Moscow State University under the unforgettable Andrey Nikolaevich Belozersky.

*Academician A. A. Bogdanov*