Preface

The present special issue stems from contributions originally presented at the Conference on 'Protein Biosynthesis' that was held at Pushchino-on-Oka, a scientific campus 100 km away from Moscow, Russia on August 27–September 1, 2001. The volume of this special issue allows us to present here only half of the more than 40 talks included in the program.

Nowadays protein synthesis is considered as a 'data-rich' branch of biochemistry and molecular biology, whereas only a decade ago it was still a 'data-poor' area of research. During the last decade several profound and unexpected achievements deeply affected this domain of biology. X-ray crystallography, NMR spectroscopy, and cryoelectron microscopy significantly contributed to our knowledge of the structure of the ribosome on its own and its RNA and protein components. Moreover, gene engineering, site-directed mutagenesis, and analysis by various tools of protein–protein and RNA–protein interactions significantly enriched and improved our understanding of the whole process. Tremendous progress was achieved in the understanding of eukaryotic protein synthesis, which as we've now learned appears to be much more sophistically regulated than in prokaryotes.

At the end of the 1960s a common illusion emerged that protein synthesis had become 'text-book knowledge', i.e. a classical field of molecular biology and biochemistry. This illusion was provoked by the deciphering of the genetic code, as well as discoveries of the major components of the protein-synthesizing machinery (mRNA, tRNA, ribosomes). Although it was true, at the same time the complexity of this process was not interpreted in terms of molecular interactions and molecular mechanisms. It is only nowadays (and it was very visible during the Pushchino Conference) that an understanding of the whole process is slowly emerging, therefore substituting the purely mechanistic description of it. Remarkably, besides the traditional fundamental aspects, technological applications have developed very rapidly, and cell-free protein synthesis is a highly promising field of biotechnology.

Even with only this very brief description, it is justified and very timely to devote a special issue of FEBS Letters to some aspects of this very broad and multisided problem. The Conference was hosted by the Institute of Protein Research, one of the leading world centers in translation and headed since 1967 by Alexander Spirin, whose 70th birthday fell on September 4, immediately following the Conference. This is why all contributors of this volume have dedicated their articles to this jubilee.

Alexander Spirin (also one of the authors of this issue) was always on the front page of translation, starting from the end of the 1950s until the beginning of the new century. During these 45 years, his contributions included both highly productive experimental as well as very imaginative and creative conceptual efforts. He significantly contributed to the prediction of the existence of mRNA in living cells, to the understanding of macromolecular structure of high-molecular weight RNAs, to the creation of a dynamic model of ribosome functioning, to self-folding of the newly synthesized proteins, to factor-free protein synthesis (a milestone of the contemporary concept of 'RNA world'), and to generation of cell-free protein synthesis technologies. The discovery of informosomes and 'masked' mRNA are also among his wide-known major achievements.

Spirin's school of translation is now ubiquitously spread over the globe and his students are among the leading scientists not only in Europe but overseas as well. Some of them are among the authors of this issue. The books and reviews written by Spirin remain a classical example of scientific logic, criticism, and imagination combined with crystal-clear presentation and style. During the Meeting the role of Spirin in the contemporary knowledge of protein synthesis was acknowledged by all participants of the Conference.

I hope that this issue, although obviously incomplete, brings to the FEBS Letters readers the flavor of the field today and shows that what seemed clear to us decades ago appears now far from being totally resolved.

This is how science moves.

Lev Kisselev

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