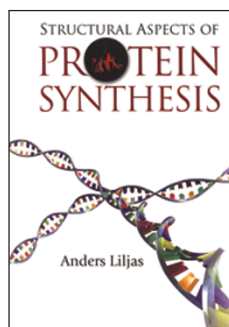


No longer lost in translation

**Structural Aspects of Protein Synthesis**

by Anders Liljas

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Reviewed by Jamie H D Cate

Here's a thought experiment. If you want to learn about a different field of science, what approach would you take? The first thing you might do is a Google search, or maybe go to PubMed to find a recent review. Try this with the ribosome or protein synthesis and you will not get far. There is just too much information to absorb. A better way would be to corner someone who has been working on protein synthesis for a long time, say decades, to get a broad perspective on what's going on. The new book by Anders Liljas entitled *Structural Aspects of Protein Synthesis* provides just that sort of an opportunity.

There has been an avalanche of new structural information about protein synthesis in the last few years that Liljas bravely takes on. The book, thirteen chapters in all, holds together by presenting new structural results in light of old questions and the history of the field. The text primarily covers prokaryotic translation, a reasonable approach considering the high level of homology across kingdoms for much of the core machinery in protein synthesis. Any researcher, including undergraduate and graduate students, who needs a concise summary of the structural basis for protein synthesis will find this book a useful resource. Those actively working in the translation field will find it useful as a reference.

Liljas sets the right tone for the book in chapters 2 and 3. The second chapter presents historical milestones in translation research. This is important, as many of the big questions arose early in the '60s and '70s and still remain to be answered. In the third chapter, many of the experimental methods that are used to probe the structure of the ribosome are presented. These cover the range from chemical and spectroscopic techniques to NMR, X-ray crystallography, electron microscopy and even mass spectrometry.

Given that this text presents structures, one would expect a number of color figures of the translation machinery. These are given in the center of the book. Most present structural models of the ribosome

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and translation factors based on X-ray crystallography and cryo-electron microscopy. The line drawings and grayscale figures—which are more numerous and appear throughout each chapter—are also quite good and add significantly to the textual descriptions. These are especially helpful in outlining what we know about all of the steps in translation initiation, elongation and termination, as well as protein targeting. The fact that many steps are only presented in schematic fashion is telling. We still know very little about the structure and dynamics of the protein synthesis machinery during most steps of the translation cycle.

Protein synthesis involves dozens of protein and RNA factors. Not surprisingly, it is easy to get lost in the nomenclature. Liljas provides a list of abbreviations at the beginning of the text, as well as useful tables throughout. In particular, tables on the names, properties and functions of the GTPases are handy to have when reading the textual description of their structure and function. Other tables provide a quick reference to the different nomenclatures used across kingdoms, a bewildering fact to anyone new to the field and even to those who have been working on translation for awhile.

Two areas that I think are critical to understanding the role of protein synthesis in the physiology of the cell are also covered in this text. The role of protein synthesis in cellular response to stress is noted in several sections throughout the text. In addition, a particularly useful chapter introduces the large variety of antibiotics that target protein synthesis, a timely subject given the spread of antibiotic resistance in pathogenic bacteria.

The text also includes an extensive list of references for those who want to follow a train of thought more deeply. A number of web sites are given that provide useful information on protein synthesis, including sites for ribosomal proteins and known translation recoding events. Missing, however, is information on web sites relevant to the phylogenetic analysis of ribosomal RNAs and tRNAs, plus modified bases in tRNAs. These should have been included given the importance of rRNA and tRNA structure in protein synthesis.

In the preface to the book, Anders Liljas admits that he is presenting a biased view of protein synthesis. Given the need to keep the book manageable in size, this is a real strength and not a weakness. The topic would otherwise bury the reader. Liljas' experience working with ribosomal proteins and translation factors makes these sections of the text the strongest. Although I would have liked to see a bit more on the role of ribosomal RNAs in the different steps of translation and the binding of antibiotics, the key findings are introduced throughout the text, and interested readers can track down the relevant papers from the list of references. I have my biases, after all.

Any text like this runs the risk of immediately becoming obsolete as a field advances. The rapid rate of progress in the ribosome field virtually guarantees this to be the case. In *Structural Aspects of Protein Synthesis*, Anders Liljas cleverly avoids this problem by giving historical context and continually bringing up the many unsolved questions that still dominate the field. These questions will not be answered quickly, so this text will be worth having on one's desk for at least a few more years. ■