Preface

In recent years, every time one of us had the occasion to mention intrinsic disorder to biochemists, invariably the response has been like—"Is it higher flexibility?" Many structural biologists (of the kind who use X-ray diffraction to probe protein structure) recognize that the lack of structure has been frequently seen in many cases of "protein structures." Hence, it was felt that there is a need for a volume, which describes proteins not in terms of the binary of structured proteins and intrinsically disordered proteins but as a continuum of both structured regions and disordered regions seamlessly playing the respective functional roles. That way the message about the importance of intrinsic order lands softly without people feeling that the old (protein) world order has collapsed and has been replaced by a new one! So, it is not about structure vs disorder; it is about structure and disorder. There is a second perception which this volume tries to alter—that not just the other noncatalytic proteins but enzymes also utilize intrinsic disorder when it is more useful for a certain role.

In last two decades or so, our perceptions of the enzyme specificity as "lock-and-key"-type correspondence have changed gradually. The specificity is context-dependent, both in terms of space and time. The former relates to cellular location and the latter to the concentration of a metabolite in the real time. Often, there is no one-to-one relationship between the lock and the key. Moonlighting and promiscuity have emerged as fairly common protein traits. This volume tries to capture these paradigm shifts as well.

The early chapters emphasize that just like structure in proteins, disorder is also sequence-dependent; just like Lindstrom-Lang's hierarchy in structured proteins, there is one in disordered proteins as well! Bioinformatics is hugely useful for finding and characterization of intrinsically disordered proteins and intrinsically disordered protein regions.

The last few chapters focus more on the consequences of disorder and how biology exploits it for creating ease of posttranslational modifications, curvatures, and condensates. Prions also seem to rely upon disorder.

We thank all the authors who took time to contribute. We thank Dr. Peter Linsley (Elsevier) for encouraging us in this task and Ms. Sara Pianawalla (Elsevier) for overseeing the production of this volume.

This volume is one of the early ones in the new series "Foundations and Frontiers in Enzymology" launched by Elsevier. Hopefully, this volume captures the snapshots of foundations (there is a chapter on history of enzymology!) as well as what is happening at the frontiers of enzymology as well in the world of proteins.

We hope that all those interested in enzymology will find this volume useful.

Munishwar Nath Gupta
Vladimir N. Uversky