

Preface

Proteins are the string of amino acids that play key roles in almost all the physiological and pathological events that are occurring in the body. Functionality of proteins is directly related to the structure they attain, which ultimately depends on the composition of their unique amino acid sequence. Protein engineering is a fledging field and a creative process to design the target proteins or signaling networks with desirable structure and functions. The idea of protein engineering is to utilize the unexplored sequence space in order to design/rewire the proteins as per human wish and for the well-being of the society. Numerous protein engineering methods have been developed that are aiding in various research and technological applications. Indeed, protein engineering has been a powerful tool in bioengineering for last couple of decades and has generated vast number of useful enzymes/proteins that have phenomenal therapeutic and industrial potential. Protein engineering field started gaining its approval for last couple of years: In 2012, the market is \$56 billion and expected to increase to 168 billion in 2017, at a Compound Annual Growth Rate (CAGR) of 10.9 % from 2012 to 2017.

In this brief, we primarily focus on most popular experimental methods and several computational programs that are being widely used under the categories of directed evolution, rational and de novo designing of proteins and their biotechnological/biomedical applications. Further, the brief sheds light on the advantages and pitfalls of the existing methodologies and their future perspectives. The book is divided into five chapters: Chapter 1 describes the fundamental aspects of protein structure–function–folding relationships and an introduction to the field of biomolecular and protein engineering techniques. Chapter 2 summarizes various experimental techniques that are used for generating novel proteins under the framework of directed evolution. Chapter 3 provides an overview of all the computational methods that aids us in understanding structure–function relationships through a rational approach. Chapter 4 highlights the protocols of de novo protein designing and combinatorial or computer-aided directed evolutionary approaches for engineering novel scaffolds. Chapter 5 provides a glimpse of several biotechnological and biomedical applications of the engineered proteins that are generated using the techniques described in Chaps. 2–4.

We anticipate that this brief will provide a broader perspective about the field of protein engineering to all the researchers planning to gain comprehensive understanding and an up-to-date knowledge about the fundamental techniques and their biotechnological/biomedical applications.

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