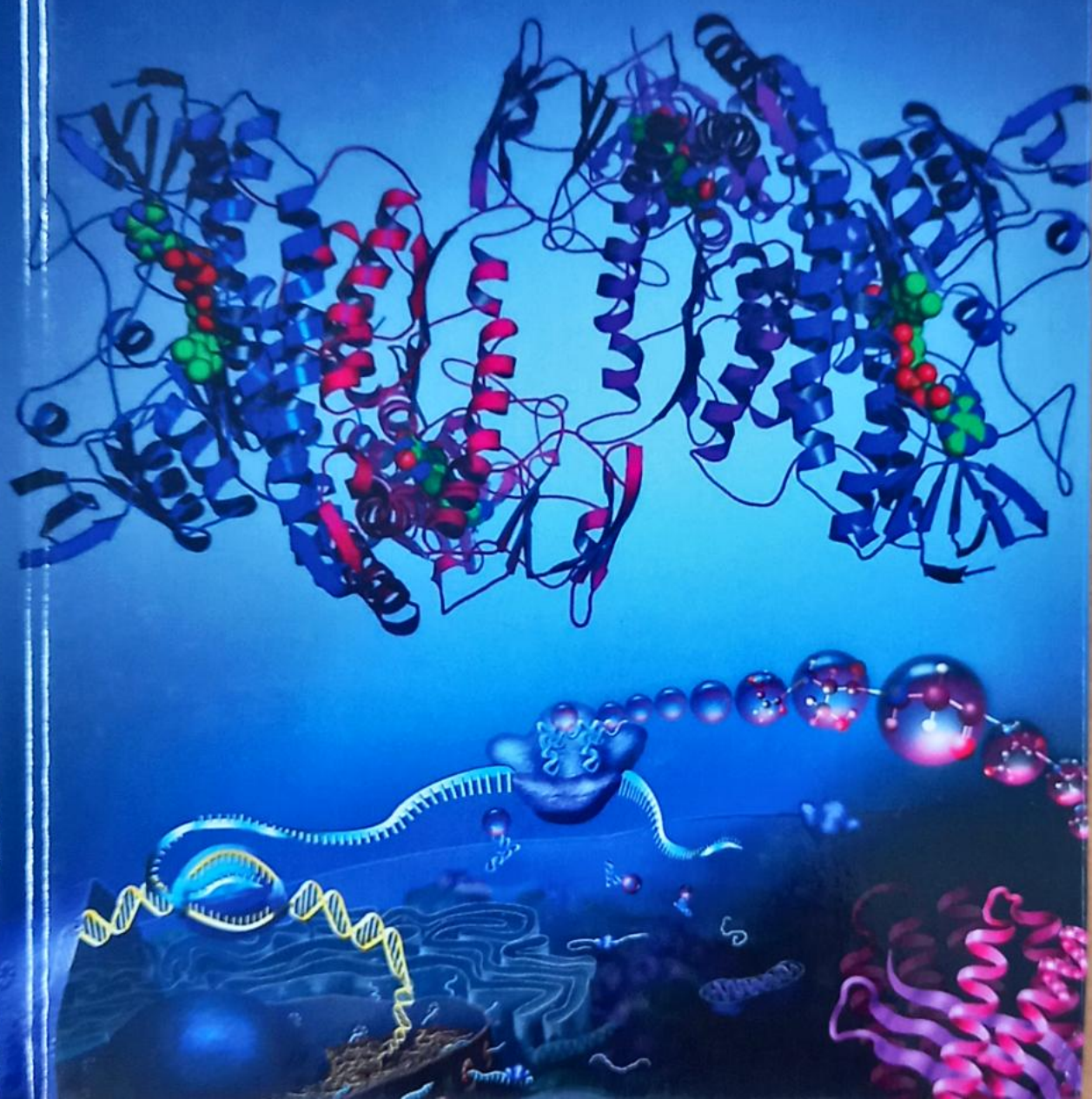


# PROTEIN ENGINEERING

Kurra Venkata Gopaiah



# Protein Engineering

## Preface

Protein engineering is the application of engineering principles to the study of proteins. It is a multidisciplinary field that combines the principles of chemistry, physics, and biology to study the structure and function of proteins. The goal of protein engineering is to design and synthesize proteins with specific functions.

Proteins are the workhorses of the cell, performing a wide variety of functions. They are involved in almost every process in the body, from metabolism to cell signaling. Understanding the structure and function of proteins is essential for understanding the basic processes of life.

**Kurra Venkata Gopaiah**

Protein engineering is a rapidly growing field, with many new applications being discovered. It has the potential to revolutionize many areas of science and technology, from medicine to agriculture. The future of protein engineering is bright, and it is an exciting time to be involved in this field.

The book is written for students and researchers in the field of protein engineering. It provides a comprehensive overview of the field, from the basic principles of protein structure and function to the latest advances in protein engineering. The book is written in a clear and concise style, making it easy to read and understand.



**RANDOM PUBLICATIONS**

**NEW DELHI (INDIA)**

## **Protein Engineering**

---

ISBN 978-93-8635-513-3

© Reserved

All Rights Reserved. No Part of this book may be reproduced in any manner without written permission.

Published in 2017 in India by

**RANDOM PUBLICATIONS**

4376-A/4B, Gali Murari Lal, Ansari Road  
New Delhi-110 002

Phone : +9111-43580356, 011-23289044, 011-43142548

e-mail: sales@randompublications.com,  
info@randompublications.com, randomexports@gmail.com

*Type Setting by : Friends Media, Delhi-110089*

*Digitally Printed at : Replika Press Pvt. Ltd.*



# Contents

---

<i>Preface</i> .....	<i>v</i>
<b>1. Introduction</b> .....	<b>1</b>
Protein Functions .....	2
Origination .....	5
Structure of Proteins .....	8
Sorting of Proteins .....	9
Proteins Fold by Progressive Stabilization of Intermediates Rather Than by Random Search .....	14
<b>2. Structure and Functions of Protein</b> .....	<b>28</b>
Miscellaneous Proteins .....	28
Peptides .....	46
Secondary Structure .....	47
Three-Dimensional Structure .....	52
<b>3. Protein Design in Molecular Manufacturing</b> .....	<b>53</b>
Protein Design .....	54
Molecular Machinery .....	55
Transmembrane Proteins .....	58
Firmness of the Argument .....	71
Applications to Computation .....	72
<b>4. Amino Acids and Proteins Structure</b> .....	<b>84</b>
Building Blocks-Amino Acids .....	84
The Primary Structure of Proteins .....	87
Secondary Structure .....	87
Tertiary Structure .....	88
Quaternary Structure .....	90
Models for the Allosteric Behaviour of Proteins .....	92
<b>5. Protein Nanotechnology</b> .....	<b>131</b>
Protein Synthesis .....	131
The Structure of Hemoglobin .....	133

Protein Synthesis in Gene Regulation .....	135
Protein-DNA Interactions .....	138
Modes of Disease Transmission .....	140
<b>6. Biological Functions of Proteins .....</b>	<b>170</b>
Proteins .....	170
Proteins are Linear Polymers of Amino Acids .....	171
Architecture of Protein Molecules .....	180
Human Biochemistry .....	185
Lipid-Anchored Membrane Proteins .....	187
<b>7. Protein Synthesis .....</b>	<b>209</b>
The Proteins .....	209
Large Molecules of Polymer .....	210
Structure of Membrane Proteins .....	214
Nature of Glycoproteins .....	217
<b>8. Enzymatic Proteins .....</b>	<b>241</b>
Characteristics of Enzymes .....	241
Transferring Enzymes (Transferases) .....	244
Enzymes and Life Processes .....	249
Enzyme Inhibition .....	252
Immobilization of Enzymes for the Fabrication of Biosensors .....	261
 <i>Bibliography</i> .....	 269
<i>Index</i> .....	271



## PROTEIN ENGINEERING

Protein engineering is the process of developing useful or valuable proteins. It is a young discipline, with much research taking place into the understanding of protein folding and recognition for protein design principles. It is also a product and services market, with an estimated value of \$168 billion by 2017. Protein engineering is the conception and production of unnatural polypeptides, often through modification of amino acid sequences that are found in nature. Synthetic protein structures and functions can now be designed entirely on a computer or produced through directed evolution in the laboratory. Protein requiring disulphide bond formation and/or isomerisation of proline peptide bonds have to be directed to the periplasm for folding (the environment of the periplasmic space is oxidising in contrast to the reducing environment of the cytoplasm). There are at least four genes involved in disulphide bond formation and editing in *E. coli* (DsbA, DsbB, DsbC and DsbD) and there is strong evidence that co-expression of the DsbA (or eukaryotic PDI) gene in the presence of a glutathione redox buffer increases the yield of several disulphide-rich proteins. In this book the subject is presented in a very systematic manner. Simple language is used, diagrams/illustrations are generously used to emphasize reaction. Sites, to indicate reaction pathways. Emphasis is placed on the correlation of the structure of functional group with its properties.

**Contents:** Introduction; Structure and Functions of Protein; Protein Design in Molecular Manufacturing; Amino Acids and Proteins Structure; Protein Nanotechnology; Biological Functions of Proteins; Protein Synthesis; Enzymatic Proteins.

### About the Author



**Kurra Venkata Gopaiah** attained B.Pharmacy from Dr. M.G.R medical University and M.Pharmacy from Jawaharlal Nehru Technological University. Pursuing Ph.D in Pharmaceutical sciences from Jaipur National University. He has attended and presented 3 National and International conferences and presented papers in various conferences around India. He is working as Asst. Prof. at Vishwa Bharathi College of Pharmaceutical Sciences, Guntur, Andhra Pradesh, India.

**RP**  
RANDOM

**RANDOM PUBLICATIONS**

PUBLISHERS • DISTRIBUTORS

4376-A/4B, Gali Murari Lal, Ansari Road, Daryaganj  
New Delhi-110002, Ph : +91-11-43142548/43580356 / 23289044  
Email : randomexports@gmail.com,  
sales@randompublications.com,  
info@randompublications.com

ISBN 978-93-8635-513-3



9 789386 1355133

6.99 (px.)