# Contents

**Preface** ........................................... \( v \)

**Contributors** ....................................... \( ix \)

1. Adjustment of Codon Usage Frequencies by Codon Harmonization
   Improves Protein Expression and Folding .......................... \( 1 \)
   **Evelina Angov, Patricia M. Legler, and Ryan M. Mease**

2. SUMO Fusion Technology for Enhanced Protein Expression
   and Purification in Prokaryotes and Eukaryotes .................. \( 15 \)
   **Raymond J. Peroutka III, Steven J. Orcutt, James E. Strickler, and Tauseef R. Butt**

3. Molecular and Chemical Chaperones for Improving
   the Yields of Soluble Recombinant Proteins ..................... \( 31 \)
   **Ario de Marco**

4. Genetic Selection of Solubility-Enhanced Proteins Using
   the Twin-Arginine Translocation System .......................... \( 53 \)
   **Adam C. Fisher, Mark A. Rocco, and Matthew P. DeLisa**

5. Protein Folding Liquid Chromatography .......................... \( 69 \)
   **Quan Bai and Xindu Geng**

6. Site-Specific Protein Labeling by Intein-Mediated Protein Ligation
   .................................................. \( 87 \)
   **Inca Ghosh, Nancy Considine, Elissa Maunus, Luo Sun, Aihua Zhang, John Buswell, Thomas C. Evans, Jr., and Ming-Qun Xu**

7. Efficient Expression of Human Aromatase (CYP19) in *E. coli* .... \( 109 \)
   **Norio Kagawa**

8. Expression of Recombinant Cytochromes c in *E. coli* ........... \( 123 \)
   **Yuri Y. Londer**

9. Semi-synthesis of Glycoproteins from *E. coli* Through
   Native Chemical Ligation ........................................ \( 151 \)
   **Jonathan P. Richardson and Derek Macmillan**

10. Expression of Recombinant Proteins with Uniform N-Termini .... \( 175 \)
    **Orsolya Király, Lan Guan, and Miklós Sabin-Tóth**

11. Recent Developments in Difficult Protein Expression: A Guide to *E. coli*
    Strains, Promoters, and Relevant Host Mutations ................ \( 195 \)
    **James C. Samuelson**

12. Periplasmic Chaperones Used to Enhance Functional Secretion
    of Proteins in *E. coli* .................................... \( 211 \)
    **Martin Schlapschy and Arne Skerra**
  Jun-ichi Nagao, Kouki Shioya, Yoshitaka Harada, Ken-ichi Okuda,
  Takeshi Zendo, Jiro Nakayama, and Kenji Sonomoto

14. The Targeted Expression of Nucleotide Sugar Transporters
to the E. coli Inner Membrane ........................................... 237
  Joe Tiralongo and Andrea Maggioni

15. Detection of Protein–Protein Interactions in Bacteria
  by GFP-Fragment Reconstitution ........................................ 251
  Akira Kanno, Takeaki Ozawa, and Yoshio Umezawa

16. Enhancing the Solubility of Recombinant Proteins
  in Escherichia coli by Using Hexahistidine-Tagged Maltose-Binding
  Protein as a Fusion Partner ............................................... 259
  Ping Sun, Joseph E. Tropea, and David S. Waugh

17. Introducing Predetermined Mutations Throughout a Target Gene
  Using TDEM (Transposon-Directed Base-Exchange Mutagenesis) ............ 275
  Yun Cheol Kim

18. Fluorescent Site-Specific Labeling of Escherichia coli Expressed Proteins
  with Sfp Phosphopantetheinyl Transferase ................................ 295
  Aihua Zhang, Luo Sun, John Buswell, Nancy Considine, Inca Ghosh,
  Anastasiya Masbrina, Christopher Noren, and Ming-Qun Xu

Index ................................................................. 309