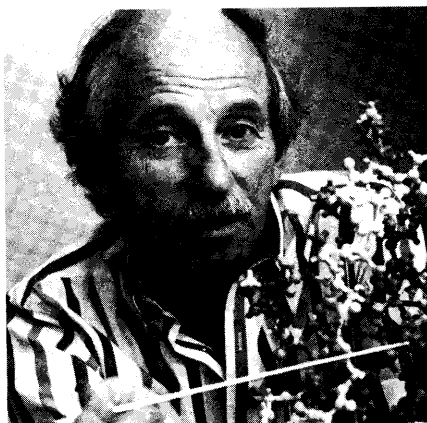


Dedication



This volume honors S. Walter Englander for his contributions to the development and application of high resolution hydrogen exchange techniques to bioenergetics. From fundamental concepts of hydrogen exchange^{1,2} to fragment separation technology developed with Joan Englander,³ the field of hydrogen exchange underwent continuous development in the Englander lab to high resolution with 'functional labeling' techniques⁴ and their unique and powerful application to intermediate states in highly cooperative systems such as Protein folding⁵ and ligand binding by hemoglobin.⁶ A faculty member of Biochemistry and Biophysics at the University of Pennsylvania School of Medicine since 1967, Walter is currently the Jacob Gershon-Cohen Professor of Medical Science. His extensive contributions have been acknowledged by his election to the National Academy of Sciences, and his appointment as Honorary Fellow of both The Biophysical Society and the AAAS. Walter's vision to pursue the development of hydrogen exchange methods has catalyzed our thinking of complex cooperative systems and processes beyond the ensemble average view, underscoring the contributions of their low abundance and short-lived intermediates, and moving structural energetics to a new level of sophistication.

JO M. HOLT
MICHAEL L. JOHNSON
GARY K. ACKERS

¹S. W. Englander, *Biochemistry* **2**, 798 (1963).

²S. W. Englander, N. W. Downer, and H. Teitelbaum, *Ann. Rev. Biochem.* **41**, 903 (1972).

³J. J. Englander, J. R. Rogero, and S. W. Englander, *Anal. Biochem.* **147**, 234 (1985).

⁴S. W. Englander and J. J. Englander, *Methods Enzymol.* **232**, 26 (1994).

⁵S. W. Englander, L. Mayne, and J. N. Rumbley, *Biophys. chem.* **101-102**, 57 (2002).

⁶J. J. Englander, J. N. Rumbley, and S. W. Englander, *J. Mol. Biol.* **284**, 1707 (1998).

Table of Contents

CONTRIBUTORS TO VOLUME 380	ix
PREFACE	xi
VOLUMES IN SERIES.	xiii

Section I. Allosteric Enzymes and Receptors

1. Contributions to the Catalytic Efficiency of Enzymes, and the Binding of Ligands to Receptors, from Improvements in Packing within Enzymes and Receptors	DUDLEY H. WILLIAMS, ELAINE STEPHENS, MIN ZHOU, AND ROSA ZERELLA	3
2. Structural Interpretation of pH and Salt-Dependent Processes in Proteins with Computational Methods	BERTRAND GARCÍA-MORENO E. AND CAROLYN A. FITCH	20
3. Electrostatic Basis for Bioenergetics	AVITAL SHURKI, MAREK ŠTRAJBL, CLAUDIA N. SCHUTZ, AND ARIEH WARSHEL	52
4. Local and Global Control Mechanisms in Allosteric Threonine Deaminase	D. TRAVIS GALLAGHER, DIANA CHINCHILLA, HEIDI LAU, AND EDWARD EISENSTEIN	85
5. Methods for Analyzing Cooperativity in Phosphoglycerate Dehydrogenase	GREGORY A. GRANT	106
6. Fluorescent Probes Applied to Catalytic Cooperativity in ATP Synthase	JOACHIM WEBER AND ALAN E. SENIOR	132
7. Measurement of Energetics of Conformational Change in Cobalamin-Dependent Methionine Synthase	VAAH BANDARIAN AND ROWENA G. MATTHEWS	152
8. Spectroscopic and Kinetic Methods for Ligand-Protein Interactions of Glutamate Receptor	VASANTHI JAYARAMAN	170
9. Quantitative Analysis and Interpretation of Allosteric Behavior	GREGORY D. REINHART	187

 Section II: Cooperativity in Protein Folding and Assembly

10. The Immobilized Template Assay for Measuring Cooperativity in Eukaryotic Transcription Complex Assembly	KRISTINA M. JOHNSON, JIN WANG, ANDREA SMALLWOOD, AND MICHAEL CAREY	207
11. Characterization of the Cargo Attachment Complex of Cytoplasmic Dynein Using NMR and Mass Spectrometry	ELISAR BARBAR AND MICHAEL HARE	219
12. Circular Dichroism of Protein-Folding Intermediates	ROBERT W. WOODY	242
13. Amide Hydrogen Exchange/Mass Spectrometry Applied to Cooperative Protein Folding: Equilibrium Unfolding of <i>Staphylococcus aureus</i> Aldolase	HAI PAN AND DAVID L. SMITH	285
14. Kinetic and Spectroscopic Analysis of Early Events in Protein Folding	DAVID S. KLIGER, EFEI CHEN, AND ROBERT A. GOLDBECK	308
15. Hydrogen-Exchange Strategies Applied to Energetics of Intermediate Processes in Protein Folding	DAVID WILDES AND SUSAN MARQUEE	328
16. Cooperativity Principles in Protein Folding	HUE SUN CHAN, SEISHI SHIMIZU, AND HÜSEYİN KAYA	350
17. Native State Hydrogen-Exchange Analysis of Protein Folding and Protein Motional Domains	CLARE WOODWARD, NATÀLIA CARULLA, AND GEORGE BARANY	379
18. The Preparation of ¹⁹ F-Labeled Proteins for NMR Studies	CARL FRIEDEN, SYDNEY D. HOELTZLI, AND JAMES G. BANN	400
AUTHOR INDEX		417
SUBJECT INDEX		435