Table of Contents

Dedication 3

Acknowledgements 4

Table of Contents 5

About the Author 8

Preface to the First Edition 9

Preface to the Second Edition 11

Prologue 12

1. An American Heritage **13**
Wildness and Wet 13

A Straw 15
The Earth, Moon and Sun 16
Diversity 17

2. Tiptoeing into the World of Ideas: CCNY **20**
New Friendships 20
Uncertainty 20
An Extraordinary Teacher 22

3. Interregnum **24**

4. Finding a Direction in the Village: NYU **27**
Friends, Colleagues, Mentors 27
Shifting Directions in the Midst of Tragedy 28
Music and Science in Traverse City 29

5. Changing Directions (Again): Chemistry at Yale **32**
The Law 32
The Times They Are A Changin' 32
The Crothers Lab 32
Lars Onsager 33
A Setback 34
Encouragement and Generosity 34
A Call From Sidney Altman 35

6. Magic on a Mesa: Los Alamos **37**
My First Encounter With Stan Ulam 37
Immunology—in Unfamiliar Territory 39

The Faustian Bargain 41

7. The Biomedical Omphalos **43**
The Selfsame Hill 43
NIH 44
The Lie That Reveals the Truth 45
Big Data in Biology: A Beginning 45
Communication 47
The DNA Sequencing Revolution 48
Another Tragedy 49
Algorithms, Soapy Peptides and Vaccines 50
A Call From the Whitehouse 50

8. The Genomic Revolution **53**
Alta Utah, 1984 53
A Reference Sequence 55
Santa Fe New Mexico, 1986 56

The Cost of a Holy Grail 59
Circling our Wagons and Firing Inward 61
The Fox Guarding the Hen House 65
A Human Genome Line Item in the President's Budget 67
FY 1988: Congress Approves a Budget for the Human Genome Project 69
Crossing the Watershed 69
The First Miracle: Political Alignment 69
Ethics Penetrates Genomics 70
The Second Miracle: Infrastructure 71

9. The Third Miracle **74**
1990: A Second Start 74
Early History 74
Linkage studies in the era of physical maps (1994–1995) 75
2010: A Decade After the Announcement 76
Technology 77
New Concepts and Their Implications 78
Accelerating Drug Development 79

2025: Surprises 81
Common Disorders 82
Newborn Sequencing 86
Success and Disappointment 87

10. Promises to Keep **89**
Dilemmas of Choice 89
Cloning 90
Social Justice 94
The Resurrection of Ethics 97
Stressing the Social Fabric 104
A Tipping Point 105

11. Home at Last: Mount Sinai Medical School **109**
A Passion for Excellence 109
A Pull From Boston: John Silber 112
Managing Change 113

12. Life Along the Charles **116**
The Evolution of a College 116
The Evolution of a Field 119
U.S. Graduate Education and National Competitiveness 125
Slowing Down 127
Bioinformatics: Educating a New Kind of Scientist 127
A New Direction 132
Sicily 134

13. Climate Change **139**
The Challenge 139
Something Can be Done About it—But Only if It's Anthropogenically Driven 142
Technological Transition: Decoupling Economic Growth From GHG Emissions 143
An Effective Approach to Climate Change Mitigation Must Include Technologies for CO_2 Drawdown 145
Harnessing Agricultural Genomics 146
Engineered Trees for Construction: A Double Win 147
An Agrogenomics Trifecta 148
Photosynthesis 149

Epilogue **152**

References and Notes **154**