Contents

Contributors ix

1. Dedication: Kenneth J. Frey: Oat Breeder, Educator, and Champion of Plant Breeding 1
   Ann Marie Thro and Larry Robertson
   I. Introduction 2
   II. Early Life and Career Beginnings 3
   III. Research 5
   IV. Graduate Educator 10
   V. Champion of Plant Breeding: The National Plant Breeding Study 12
   VI. The Man 16
   VII. Awards and Honors 17
   VIII. Epilogue 18
   Literature Cited 19
   Selected Publications of Kenneth J. Frey 21

2. Strategies for Enhancing Grain Yield in Maize 37
   M. Tollenaar and E. A. Lee
   I. A Historical Perspective 38
   II. Opportunities for Future Yield Improvement 44
   III. Plant Density 48
   IV. Improvement in Resource-Use Efficiency 60
   V. Conclusions 73
   Literature Cited 75
3. Quality Protein Maize: Progress and Prospects 83
   G. N. Atlin, N. Palacios, R. Babu, B. Das, S. Twumasi-Afriyie,
   D. K. Friesen, H. De Groote, B. Vivek, and K. V. Pixley
   I. Introduction 84
   II. Quality Protein Maize: A Complex Genetic and
       Biochemical System 87
   III. Human Nutritional Benefits of QPM 97
   IV. QPM as Livestock Feed 101
   V. Progress in the Development of QPM Hybrids
       and Synthetics 106
   VI. Release and Adoption of QPM Cultivars 115
   VII. Conclusions 121
   Literature Cited 124

4. Vegetative Phase Change in Maize:
   Biotic Resistance and Agronomic Performance 131
   M. A. Chandler, E. S. Riedeman, and W. F. Tracy
   I. Introduction 132
   II. Vegetative Phase Change and Biotic Resistance
       in Maize 138
   III. Vegetative Phase Change and Agronomic Performance in Maize 149
   IV. Vegetative Phase Change and Pest Resistance on
       Other Plant Species 151
   V. Summary and Conclusions 154
   Literature Cited 155

5. Plant Interspecific Hybridization: Outcomes
   and Issues at the Intersection of Species 161
   Ed R. Morgan, Gail M. Timmerman-Vaughan,
   Anthony J. Conner, William B. Griffin, and
   Richard Pickering
   I. Introduction 163
   II. Species and Hybrids 165
   III. Protocols for Hybridization 169
   IV. Outcomes of Hybridization 173
V. Genomic and Gene Expression Consequences of Interspecific Hybridization 186
VI. Verification of Hybrids 193
VII. Estimating Donor Parental DNA Content in Progeny From Hybrids 202
VIII. Conclusions 205
Literature Cited 207

6. DNA-Based Identification of Clonally Propagated Cultivars 221
Hilde Nybom and Kurt Weising

I. Introduction 223
II. Molecular Methods 224
III. Choice of Method 238
IV. Applications 251
V. Conclusions and Future Outlooks 277
Literature Cited 278

Guoyou Ye and M. van Ginkel

I. Introduction 299
II. Requirements for Modeling Breeding Program 300
III. Recent Development in Genetic Mapping 305
IV. Investigating the Effectiveness of MAS Strategies 313
V. Examples to Demonstrate the Design of MAS Strategies 323
VI. Prospects 341
VII. Conclusion 343
Literature Cited 344

Subject Index 349

Cumulative Subject Index 351

Cumulative Contributor Index 373