Heterosis Pioneers

J.F. Crow

Yuan Longping

F.W. Schnell

G.R. Sprague, Jr.
accepting for G.F. Sprague, Sr.

E.J. Wellhausen

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Genetics and Exploitation of Heterosis in Crops

Editors
James G. Coors and Shivaji Pandey

Associate Editors
Arnel R. Hallauer, Delbert C. Hess, Maarten van Ginkel, Kendall R. Lamkey, Albrecht E. Melchinger, Ganesan Srinivasan, and Charles W. Stuber

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PREFACE

The chapters for this book are based on 40 plenary presentations by invited speakers and related question-and-answer sessions from the international symposium, The Genetics and Exploitation of Heterosis in Crops. The Symposium was organized and hosted by the International Maize and Wheat Improvement Center (Centro Internacional de Mejoramiento de Maiz y Trigo, CIMMYT) in Mexico City, 17–22 August 1997. The chapters basically follow the order of the symposium's nine half-day sessions.

The event focused attention on the momentous contributions of hybrid crop varieties and encouraged experts worldwide to share their knowledge on the phenomenon of hybrid vigor, which is expected to play a key role in meeting humanity's expanding food and feed demands in the future. The symposium drew more than 500 participants—nearly three-quarters of whom came from developing countries—and featured 145 posters in addition to the plenary presentations. The technical program covered actual and potential contributions of heterosis to food security and natural resource conservation through its use in a range of crops—including maize, rice, wheat, sorghum, millets, cotton, vegetables, and oil seeds. Of particular interest were the studies on the genetic, physiological, biochemical, and molecular bases of heterosis that may lead to new strategies for the effective use of hybrid vigor. Among the major conclusions were the following:

- Heterosis is much more widely used in crops than the organizers of the symposium originally envisaged.
- Scientists now generally agree on the genetic mechanisms that underlie heterosis. Dominance, as opposed to overdominance, and epistasis are generally accepted as the principal factors.
- A much clearer understanding of the molecular basis of heterosis emerged; it now seems possible to identify and, eventually, tag the major genes involved in heterosis, allowing their transfer and control by geneticists and breeders.
- Mutations are responsible for a greater proportion of genetic variation than was first thought, and may underlie continued gains in hybrid maize in temperate areas; the importance of genetic diversity in general was emphasized repeatedly.
- Investment in hybrid technology for the cereals appears to make particularly good sense for countries such as China and India to meet domestic demands, and others, such as Brazil, Thailand, Argentina, Myanmar, and South Africa, to produce for exports markets.

Extended abstracts (including methods, results, and selected data) for all presentations and posters were published in a book distributed at the symposium and available through CIMMYT. In a symposium dinner ceremony, five pioneers in research on heterosis—James F. Crow, Yuan Longping, F.W. Schnell, George F. Sprague, and Edwin J. Wellhausen—received special awards for their contributions. Beyond the scientific community itself, extensive media coverage of the symposium brought the issues of food security, sustainable agriculture, and the role of international agricultural research before a global audience.

The Technical Steering Committee and the Editorial Board for this symposium are very grateful to all the authors, reviewers, and sponsors who made the symposium so enjoyable and worthwhile. Special thanks goes to the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America for publishing the book.

Editorial Board:

J.G. Coors  A.R. Hallauer  A.E. Melchinger
S. Pandey  D.C. Hess  G. Srinivasan
M.V. Ginkel  K.R. Lamkey  C.W. Stuber
CONTRIBUTORS

J. Axtell Professor, Department of Agronomy, Purdue University, 1150 Lilly Hall, West Lafayette, IN 47907-1150

D. Andrews Professor, Department of Agronomy, 328 Keim Hall, University of Nebraska, Lincoln, NE 68583-0915

R. Bernardo Assistant Professor, Department of Agronomy, Purdue University, 1150 Lilly Hall of Life Sciences, West Lafayette, IN 47907-1150

N.E. Borlaug Senior Consultant to the Director General, CIMMYT, Lisboa 27, Apdo. Postal 6-641, 06600 México, D.F., México

J.L. Brewbaker Professor, Department of Horticulture, University of Hawaii, 3190 Malle Way, Rm. 102, Honolulu, HI 96822

M. Cooper Senior Lecturer, School of Land and Food, St. Lucia Campus, University of Queensland, Brisbane, Qld. 4072, Australia

J.G. Coors Professor, Department of Agronomy, University of Wisconsin, Madison, WI 53706

H. Cordova Leader of Tropical Maize Program, CIMMYT, Lisboa 27, Apdo. Postal 6-641, 06600 México, D.F., México

J.F. Crow Professor, Department of Genetics, University of Wisconsin, Madison, WI 53706

A. Dhopte Professor, Department of Botany, Punjabrao Krishi Vidyapeeth, Akola 444 104, Maharashtra, India

D.N. Duvick Affiliate Professor of Plant Breeding, Department of Agronomy, Iowa State University, P.O. Box 446, 6837, N.W. Beaver Drive, Johnston, IA 50131-0446

J.D. Eastin Professor, Department of Agronomy, University of Nebraska, P.O. Box 830817, Lincoln, NE 68583-0817

J.W. Edwards Graduate Research Assistant, Department of Agronomy, Iowa State University, Ames, IA 50011-1010

G.O. Edmeades Interim Director of Maize Program, CIMMYT, Lisboa 27, Apdo. Postal 6-641, 06600 México, D.F., México

G. Ejeta Professor, Department of Agronomy, Purdue University, West Lafayette, IN 47907-1150

S.A. Engelbrecht General Manager of Operations, Sensako, P.O. Box 3295, Brits 9700, South Africa
G.I. Gandoul
Department of Agronomy, University of Nebraska, P.O.
Box 830817, Lincoln, NE 68583-0817

T.J. Gerik
Blackland Research Center, 808 E. Blackland Road,
Temple, TX 76502

H.H. Geiger
Professor of Population Genetics, University of
Hohenheim, 350 Institute of Plant Breeding, Seed Science
and Population Genetics, D-70593 Stuttgart, Germany

M.V. Ginkel
Head, Bread Wheat Program, CIMMYT, Lisboa 27, Apdo.
Postal 6-641, 06600 México, D.F., México.

I.L. Goldman
Associate Professor, Department of Horticulture, Universit
of Wisconsin, 1575 Linden Drive, Madison, WI 53706-1597

J.M. González
Head, Departamento de Coordinación y Desarrollo,
Centro de Investigaciones Agrarias de Mabegondo, Apdo.
10, 15080 La Coruña, Spain

M.M. Goodman
William Neal Reynolds and Distinguished University
Professor, Crop Science Department, North Carolina State
University, Box 7620, Raleigh, NC 27695

C.J. Goodnight
Associate Professor, 115 Marsh Life Science Building,
Department of Biology, University of Vermont, Burlington
VT 05405-0086

A. Grunst
Consultant, 120 S. 32nd Street, West Des Moines, IA
50265

A.R. Hallauer
C.F. Curtiss Distinguished Professor in Agriculture
Professor, Department of Agronomy, Iowa State University
Ames, IA 50011-1010

W. Hanna
Research Geneticist, USDA-ARS-SAA, Coastal Plain Exp.
Stn., P.O. Box 748, Tifton, GA 31793-0748

V.G. Hernandez
Director, Centro de Genetica, Colegio de Postgraduados,
Montecillo, México 56230

D. Hess
Retired Director, CIMMYT Maize Program, #7 Merion
Street, Abilene, TX 79606

K. Hoard
Research Analyst, 13247 NW 121st Place, Madrid,
IA50156

M.R.A. Hovney
Agricultural Research Center, Sorghum Research
Department, Shandowell Station, Sohag, Egypt

R.B. Hunter
Manager of Product Development, Novartis Seeds, R.R. #1
Plattsville, Ontario N0J 1S0, CANADA

Y. Ibrahim
Graduate Research Assistant, Department of Agronomy,
Purdue University, West Lafayette, IN 47907-1150
James Troop Distinguished Professor of Horticulture, Department of Horticulture and Landscape Architecture, Purdue University, West Lafayette, IN 47907-1165

General Manager of Cereal Grain Research, Sensako, P.O. Box 556, Bethlehem 9700, South Africa


Graduate Research Assistant, Department of Genetics and Plant Breeding, Aristotelian University of Thessaloniki, P.O. Box 261, 540 06 Thessaloniki, Greece

Wheat Breeder, Sensako, P.O. Box 556, Bethlehem 9700, South Africa

Research Geneticist, Department of Agronomy, Iowa State University, Ames, IA 50011-1010

Research Geneticist, USDA-ARS, Department of Agronomy, Iowa State University, Ames, IA 50011-1010

Professor, Department of Agronomy, Iowa State University Ames, IA 50011-1010

Senior Vice President (retired), Dekalb Genetics, 4511 9th Street, Lubbock, TX 79416

Wheat Breeder, Sensako, P.O. Box 556, Bethlehem 9700, South Africa

Professor, Institute of Plant Breeding, Seed Science and Population Genetics, University of Hohenheim, 70593 Stuttgart, Germany

Research Geneticist, Crop Genetics and Production Research, Box 314, Stoneville, MS 38776

Senior Scientist, University of Hohenheim, Landessaatzuchtanstalt (720), D-70593 Stuttgart, Germany

Research Geneticist, USDA-ARS, Northern Crop Science Laboratory, P.O. Box 5677, Fargo, ND 58102

Professor, Departamento de Genética, Universidade de São Paulo/ESALQ, Caixa Postal 83, 13400-970, Piracicaba, São Paulo, Brazil

Centro de Genética, Colegio de Postgraduados, Montecillo México 56230

Professor, Institute for Agricultural Research, Ahmadu Bello University, P.M.B. 1044, Samaru-Zaria, Nigeria
L. M. Onofre  
Centro de Genetica, Colegio de Postgraduardos, Montecillo  
México 56230

P. Ozias-Akins  
Associate Professor, Coastal Plain Exp. Stn., P.O. Box 748  
Tifton, GA 31793-0748

S. Pandey  
Maize Program Director, CIMMYT, Lisboa 27, Apdo.  
Postal 6-641, 06600 México, D.F., México

R. Pandya-Lorch  
Coordinator, 2020 Vision for Food, Agriculture and the  
Environment Initiative, International Food Policy Research  
Institute, 2033 K Street N.W., Washington, DC 20006

C.L. Petersen  
Department of Agronomy, University of Nebraska, P.O.  
Box 830817, Lincoln, NE 68583-0817

P.A. Peterson  
Professor, Departments of Agronomy, Zoology, and  
Genetics, Iowa State University, Ames, IA 50011-1010

R.L. Phillips  
Regents’ Professor, Department of Agronomy and Plant  
Genetics, University of Minnesota, St. Paul, MN 55108

P.L. Pingali  
Director, Economics Program, CIMMYT, Lisboa 27, Apdo  
Postal 6-641, 06600 México, D.F., México

P. Pinstrup-Andersen  
Director General, International Food Policy Research  
Institute, 2033 K Street N.W., Washington, DC 20006

D.W. Podlich  
Quantitative Geneticist, School of Land and Food, St.  
Lucia Campus, University of Queensland, Brisbane, Qld.  
4072, Australia

A. Polidoros  
Postdoctoral Fellow, Department of Genetics and Plant  
Breeding, Aristotelian University of Thessaloniki, P.O.  
Box 261, 540 06 Thessaloniki, Greece

T.G. Reeves  
Director General, CIMMYT, Lisboa 27, Apdo. Postal 6-  
641, 06600 México, D.F., México

D. Roche  
Research Geneticist, USDA-ARS-SAA, Coastal Plain Exp.  
Stn., P.O. Box 748, Tifton, GA 31793-0748

F. Shaw  
Research Associate, Ecology, Evolution and Behavior  
Department, 1987 Upper Buford Circle, St. Paul, MN  
55108

R. Shaw  
Associate Professor, Ecology, Evolution and Behavior  
Department, 1987 Upper Buford Circle, St. Paul, MN  
55108

J.S.C. Smith  
Germplasm Security Coordinator–Research Fellow,  
Pioneer Hi-Bred International, P.O. Box 1004, 7300 NW,  
62nd Ave., Johnston, IA 50131-1004
O.S. Smith  
Research Fellow, Pioneer Hi-Bred International, P.O. Box 1004, 7300 NW, 62nd Ave., Johnston, IA 50131-1004

C.L. Souza, Jr.  
Professor, Departamento de Genética, Universidade de São Paulo/ESALQ, Caixa Postal 83, 13400-970, Piracicaba, São Paulo, Brazil

G. Srinivasan  
Leader of Subtropical Maize Program and Head of International Testing, CIMMYT, Lisboa 27, Apdo. Postal 6-641, 06600 México, D.F., México

C.W. Stuber  
Professor (Emeritus), Department of Genetics, North Carolina State University, Raleigh, NC 27695-7614

W.G. Sun  
Researcher, Hawaii Agricultural Research Center, 99-193 Aiea Heights Rd., Aiea, HI 96701

E. Tani  
Postgraduate Assistant, Department of Genetics and Plant Breeding, Aristotelian University of Thessaloniki, P.O. Bo 261, 540 06 Thessaloniki, Greece

A.S. Tsaftaris  
Professor, Department of Genetics and Plant Breeding, Aristotelian University of Thessaloniki, P.O. Box 261, 540 06 Thessaloniki, Greece

S.K Vasal  
Distinguished Scientist and Liaison Officer, CIMMYT Asian Regional Maize Program, P.O. Box 9-188, Bangkok 10900, Thailand

P.K. Verma  
Proagro Seed Company Ltd., B-1-39 Toli Chowki, Hyderabad AP 500 008, India

S.S. Virmani  
Plant Breeder cum Deputy Head, Plant Breeding, Genetics and Biochemistry Division, International Rice Research Institute, P.O. Box 933, Manila, Philippines

S.J. Wall  
Senior Research Associate, Pioneer Hi-Bred International P.O. Box 1004, 7300 NW, 62nd Ave., Johnston, IA 50131 1004

T.C. Wehner  
Professor, Department of Horticultural Science, North Carolina State University, Box 7509, Raleigh, NC 27695-7609

M.W. Witt  
Kansas Agric. Exp. Stn. Eminence Rt., Garden City Branch Garden City, KS 67846

W.L. Woodman  
Research Associate, Department of Agronomy, Iowa State University, Ames, IA 50011-1010

F. Zavala-Garcia  
Facultad de Agronomía U.A.N.L., Apartado Postal #358, 66450 San Nicolas de los Garza N.L., Ubicacion de la Facultad, Carretera Zuazua-Marin Km. 17, 66700 Marin N.L., México