Histories of Maize

The Italian explorer Girolamo Benzoni (c. 1541–55) recorded the steps involved in processing husked corn to make fresh dough. First the kernels were ground with a *mano* and *metate* and then patted into small cakes and finally cooked on a *comal* or griddle (from Girolamo Benzoni, *La historia del mondo nvovo di M. Girolamo Benzoni Milanese*, Venetia, F. Rampazeto. 1565. p. 56, verso). Images such as this woodcut and accounts from various chroniclers who came to the New World emphasized the role of maize as a primary staple, the staff of life, essentially synonymous to Old World wheat and barley. These early descriptions and the later role of maize as one of the world's primary economic staples predisposed many scholars to emphasize and, in some instances, assert that *Zea mays* L. was the catalyst to the development of civilization in this hemisphere. The contributions in this volume demonstrate that its role was more complex and varied than had been previously assumed. These histories of maize show that in some cases its symbolic role to ethnic identity, religion, and elite status may have been as important as its economic role to such developmental processes. (Courtesy of the Rare Books Division, The New York Public Library, Astor, Lenox and Tilden Foundations)

Histories of Maize

Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize

Edited by

John E. Staller
Department of Anthropology
University of Kentucky

Robert H. Tykot
Department of Anthropology
University of South Florida

Bruce F. Benz
Department of Biology
Texas Wesleyan University

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In memory of Richard S. MacNeish and Donald W. Lathrap for their inspiration, insights, and pioneering research on the origin and culture history of maize.

Contents

PART

II

STABLE ISOTOPE ANALYSIS AND HUMAN DIET

Contributors

Karen R. Adams (33) Crow Canyon Archaeological Center, Tucson, Arizona 85716

Janis B. Alcorn (43) The Garfield Foundation, Chevy Chase, Maryland 20815

Traci Ardren (13) Department of Anthropology, University of Miami, Coral Gables, Florida 33124

Larry Benson (21) U.S. Geological Survey, Boulder, Colorado 80303

Bruce F. Benz (2, 5, 48) Department of Science and Mathematics, Texas Wesleyan University, Ft. Worth, Texas 76105

Michael Blake (4, 12) Department of Anthropology and Sociology, University of British Columbia, Vancouver, British Columbia V6T 1Z1, Canada

Renée M. Bonzani (25) Department of Anthropology, University of Kentucky, Lexington, Lexington, Kentucky 40506

Joan Brenner Coltrain (20) Department of Anthropology, University of Utah, Salt Lake City, Utah 84112

Terence A. Brown (1) Faculty of Life Sciences, Jacksons Mill, University of Manchester, Manchester M60 1QD, United Kingdom

Cecil H. Brown (47) Department of Anthropology, Northern Illinois University, DeKalb, Illinois 60115

Eugenia Brown Mansell (13) Department of Anthropology, University of South Florida, Tampa, Florida 33620

Maria C. Bruno (31) Department of Anthropology, Washington University in St. Louis, St. Louis, Missouri 63130

Richard L. Burger (14) Department of Anthropology, Yale University, New Haven, Connecticut 06520

Shawn W. Carlyle (20) Department of Anthropology, University of Utah, Salt Lake City, Utah 84112

Sergio J. Chávez (30, 45) Department of Anthropology, Central Michigan University, Mt. Pleasant, Michigan 48859

Li Cheng (5) Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona 85721

Elizabeth S. Chilton (39) Department of Anthropology, University of Massachusetts, Amherst, Massachusetts 01003

Brian Chisholm (12) Department of Anthropology and Sociology, University of British Columbia, Vancouver, British Columbia V6T 1Z1, Canada

Gary W. Crawford (40) Department of Anthropology, University of Toronto at Mississauga, Mississauga, Ontario L5L 1C6, Canada

Bruce H. Dahlin (13) Department of Sociology and Anthropology, Howard University, Washington, D.C. 20059

Warren R. DeBoer (24) Department of Anthropology, Queens College, City University of New York, Flushing, New York 11367

William E. Doolittle (8) Department of Geography, University of Texas, Austin, Texas 78712

Robert A. Dull (26) Department of Geography and the Environment, University of Texas, Austin, Texas 78712

Chris Eastoe (5), Department of Geosciences, University of Arizona, Tucson, Arizona 85721

Barbara Edmonson (43) Department of Anthropology, Tulane University, New Orleans, Louisiana 70118

Richard I. Ford (35), Museum of Anthropology, University of Michigan, Ann Arbor, Michigan 48109

David A. Freidel (13) Department of Anthropology, Southern Methodist University, Dallas, Texas 75275

Richard Friedman (21) City of Farmington Geographic Information Systems, Farmington, New Mexico 87401

Adolfo F. Gil (15) CONICET; Departamento de Antropología, Museo de Historia Natural de San Rafael, (5600) San Rafael, Mendoza, Argentina

Diana M. Greenlee (16) Department of Anthropology, University of Washington, Seattle, Washington 98195

Robert J. Hard (33) Department of Anthropology, University of Texas at San Antonio, San Antonio, Texas 78249

Christine A. Hastorf (31) Department of Anthropology, University of California-Berkeley, Berkeley, California 94720

Cándido Hernández Vidales (43) Tamjajnec, San Antonio via Coxcatlan, San Luis Potosi CP 79830, Mexico

Jane H. Hill (46) Department of Anthropology, University of Arizona, Tucson, Arizona 85721

Nicholas A. Hopkins (44) Department of Modern Languages and Linguistics, Florida State University, Tallahassee, Florida 32306

Sally P. Horn (27) Department of Geography, The University of Tennessee, Knoxville, Tennessee 37996

Lisa W. Huckell (7) Maxwell Museum of Anthropology and University of New Mexico

Hugh H. Iltis (3) Department of Botany Herbarium, University of Wisconsin-Madison, Madison, Wisconsin 53706

Viviane Jaenicke-Després (6) Department of Molecular Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig D-04103, Germany

Joel C. Janetski (20) Department of Anthropology, Brigham Young University, Provo, Utah 84602

M. Anne Katzenberg (19) Department of Archaeology, University of Calgary, Calgary, Alberta T2N 1N4, Canada

Jennifer A. Kelly (18), Department of Anthropology, University of South Florida, Tampa, Florida 33620

Greg Laden (9) Department of Anthropology, University of Minnesota, Minneapolis, Minneapolis 55455

Steven W. Leavitt (5) Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona 85721

Fred J. Longstaffe (11) Department of Earth Sciences, The University of Western Ontario, London, Ontario N6A 5C2, Canada

Robert Lusteck (37) Department of Anthropology, University of Minnesota, Minneapolis, Minneapolis 55455

Jonathan B. Mabry (8) Desert Archaeology, Inc., Tucson, Arizona 85716

A.C. MacWilliams (33) Department of Archaeology, University of Calgary, Calgary, Alberta T2N 1N4, Canada

William L. Merrill (33) Department of Anthropology, Smithsonian Institution, Washington, D.C. 20002

Jerald T. Milanich (18), Department of Anthropology, University of South Florida, Tampa, Florida 33620

Jane Mt. Pleasant (38) Horticulture Department, Director of the American Indian Program, Cornell University, Ithaca, New York 14853

Thomas P. Myers (36) Professor and Curator, University of Nebraska State Museum, Lincoln, Nebraska 68588

Gustavo Neme (15) CONICET; Departamento de Antropología, Museo de Historia Natural de San Rafael, (5600) San Rafael, Mendoza, Argentina

Lee A. Newsom (23) Department of Anthropology, The Pennsylvania State University, University Park, Pennsylvania 16802

Augusto Oyuela-Caycedo (25) Department of Anthropology, University of Florida, Gainesville, Florida 32611

Katharine D. Rainey (34) Archaeobotanical Consultant, Huntersville, North Carolina 28078

Robert L. Rankin (41) Department of Linguistics, University of Kansas, Lawrence, Kansas, 66044

J. Scott Raymond (24) Department of Archaeology, University of Calgary, Calgary, Alberta T2N 1N4, Canada

Eleanora A. Reber (17) Department of Anthropology, University of North Carolina, Wilmington, North Carolina 28401

Mario A. Rivera (29) Beloit College, Beloit, Wisconsin

John R. Roney (33) Albuquerque Field Office, Bureau of Land Management, Albuquerque, New Mexico 87107

Della Saunders (40) Department of Anthropology, University of Toronto at Mississauga, Mississauga, Ontario L5L 1C6, Canada

Henry P. Schwarcz (11, 22), School of Geology and Geography, McMaster University, Hamilton, Ontario L8S 4L9, Canada

Ruth Shady (28) Director, Caral-Supe Special Archaeological Project, Jr. De La Unión No. 1040, 3 er. Piso, Lima, Perú

Nicole R. Shelnut (15) Department of Anthropology, University of South Florida, Tampa, Florida 33620

Bruce D. Smith (6) Archaeobiology Program, Smithsonian Institution, Washington, D.C. 20013

David G. Smith (40) Department of Anthropology, University of Toronto at Mississauga, Mississauga, Ontario L5L 1C6, Canada

Katherine A. Spielmann (34) Department of Anthropology, Arizona State University, Tempe, Arizona 85287

John E. Staller (32, 48) Department of Anthropology, University of Kentucky, Lexington, Kentucky 40506

John Stein (21) Navajo Nation Historic Preservation Department, Chaco Protection Sites Program, Window Rock, Arizona 86515

Brian Stross (42) Department of Anthropology, The University of Texas at Austin, Texas 78712

Howard Taylor (21) U.S. Geological Survey, Boulder, Colorado 80303

Robert Thompson (30) Interdisciplinary Archaeological Science, University of Minnesota, Minneapolis

Robert H. Tykot (10, 13, 14, 15, 18) Department of Anthropology, University of South Florida, Tampa, Florida 33620

Nikolaas J. van der Merwe (14) Department of Archaeology, University of Cape Town, South Africa, Rondebosch 7701, South Africa

Bradley J. Vierra (35) ENV-ECO, MS M887, Los Alamos National Laboratory, Los Alamos, New Mexico

Christine D. White (11) Department of Anthropology, The University of Western Ontario, London, Ontario N6A 5C2, Canada

William T. Whitehead (31) Department of Anthropology and Sociology, Ripon College, Ripon, Wisconsin 54971

Thomas C. Windes (21) National Park Service, Albuquerque, New Mexico 87106

Melanie Wright (31) UK Data Archive, University of Essex, Colchester, Essex CO4 3SQ, United Kingdom

An Introduction to the Histories of Maize

JOHN E. STALLER

Department of Anthropology, University of Kentucky, Lexington, Kentucky[1]

The goal of the editors of this volume on maize is to bring together contributions, which would individually incorporate and collectively assemble a comprehensive multidisciplinary set of data, that developed particular lines or types of evidence from specific time periods (and regions) throughout the Pre-Columbian geographic range of maize cultivation.[2] Another primary goal in organizing this volume was to be holistic, in that the total range of coverage would encompass the entire Western hemisphere and include research from the social, biological, and earth sciences. This volume is organized into five parts dealing with different aspects and regions of research on the origin and spread of maize science. The scope and breadth of the research takes into account recent methodological and technological innovations from the physical, biological, and social sciences. These recently developed technical and methodological approaches provide ever-increasing detail and direct evidence on the antiquity, evolution, and cultural importance of maize in the ancient Americas. We believe that such approaches have essentially transformed our understanding of the roles and importance of maize and other domesticates to sociocultural developments in prehistory, making this publication timely. My colleagues, Robert H. Tykot and Bruce F. Benz, and I hope that the readers of this volume agree that the research presented herein has established this to be the case.

One of our two European contributors observed that such a book could never have been realized had it been organized and published outside of North America (see Chapter 1). Rather it would have been broken up into several books specialized on the respective scientific discipline and specialization concerned. These volumes would have presumably included research that was specifically geared to the interested specialists in those fields. Archaeological research on the domestication of grains in the Old World has developed within competing models that consider "acculturation" or "waves of advance," whereas in the Americas they have generally been couched within foraging–farming dichotomies that are specific and distinct to different regions of the hemisphere and their associated time periods [4, 5, 6, 9, 19].

Although the Old World approaches lend themselves well to models used or tested by human geneticists and linguists, they have generally been anathema to North American archaeologists. In the Old World, emphasis has been placed on initial causes or events (as opposed to earliest presence), whereas here in the Americas there has been a clear focus on the developmental or evolutionary, or both, processes associated with plant domestication and maize agriculture. The Old World emphasis on migration and diffusion of plant domestication also takes away from the general focus on the distinctions that important cultigens had to different regions and time periods, whereas in the Americas this has been clearly evident in the methodological approaches to understanding the archaeological record (see Chapters 23 and 36). Despite differences in theoretical and methodological approaches to plant domestication in general and economic plants (mainly grains) in particular, the assumption that maize, like wheat and barley in the Old World, provided the economic basis for the development of civilization has been a central thesis among scholars in the archaeological sciences in both hemispheres. Remarkably, many of the contributions in this volume challenge those basic assumptions.

Although the chapters in this volume appear to support the contention that maize was a major economic staple, some contributions herein indicate that when and where this occurred is dramatically different than had been previously suggested in the literature. Other contributors present evidence to suggest that the way maize affected sociocultural processes is in fact far more complex and varied than had

[1]Research Associate, Department of Anthropology, The Field Museum, Chicago, Illinois

[2]The creation of this volume on the Histories of Maize was inspired in part through collaboration with several colleagues, T. Michael Blake, John P. Hart, and Robert G. Thompson, in putting together a four-part symposium on maize titled *Stories of Maize* for American archaeology that was presented at the 69th Annual Meeting of the Society for American Anthropology in Montreal, Canada, March 31–April 4, 2004.

been originally assumed (see Chapters 8 and 21). One of the primary themes that run through many of these contributions, particularly the paleodietary evidence from stable carbon isotopes, is that maize was not initially the important economic food source that many archaeologists assumed (see Chapters 2, 3, 5, 6, 11–13, 20, and 28). In some cases, it never achieved economic importance in certain regions, although it did seem to play an important role in other aspects of sociocultural development (see Chapters 24, 25, and 30). Another important divergence from previous assumptions brought out by this volume is that maize was only domesticated once. Its ancestor, teosinte *(Zea mays* ssp. *parviglumis),* was domesticated in the Balsas River drainage of central Mexico (Chapters 2 and 3) [14]. This differs from previous hypotheses regarding a tripartite origin of maize promoted by Mangelsdorf [13] and others and by extension the possibility of multiple domestication events in different regions of the Americas [8, 11, 15, 17].

Since the publication of the DNA microsatellite data on extant populations of maize and teosinte in 2002, research on ancient maize has been at a historical crossroads [14]. These important data suggest that like most of the Old World staples, maize was only domesticated once, but rather than focus on the migrations of farming populations or the acceptance of maize agriculture in diverse regions, what the contributions in this volume suggest is that there will be an even greater appreciation for research on maize from the social and particularly the biological sciences. The botanical evidence has historically influenced archaeological interpretation, but the recent evidence from molecular biology suggests that such data may now set the limits for what is possible regarding the ancient origins and early spread of maize in the Americas [7].

The holistic approach we have inherited from the founders of *American Anthropology* is largely responsible for the multidisciplinary organization of this volume [12, 16, 21–24]. They provided Americanist archaeology with the possibility that such multidisciplinary approaches could ever have been brought together as a single reference source on maize science.

Many recent advances to our knowledge come from new scientific techniques and approaches to the direct study of archaeological maize collections and the physical remains of the human populations who consumed it (Chapters 29 and 31). The development of Accelerator Mass Spectrometry (AMS) radiocarbon dating has had a profound effect in our understanding of the chronological spread of maize in the Americas and greatly revised our previous assumptions of its antiquity based on indirect dating techniques [2, 3, 18, 20]. The recent techniques involving isotope analysis, including research on phytoliths, have provided detailed information on the antiquity and role of maize to ancient cultures throughout the Americas and are highlighted and referenced throughout the volume (Chapters 9, 17, 30, and 37). These state-of-the-art scientific approaches and their associated methodologies stand in contrast to the more traditional forms of analyses such as historical linguistics, archaeological analysis of stratigraphy, and the classification and detailed study of artifacts.

The first section of this volume deals with the molecular, biological, and morphological research that has so greatly affected recent research on maize. This section of the volume also includes a detailed analysis of the chronology of its spread in the Americas (see Chapter 4). Recently developed techniques in maize DNA research have also revised our earlier perceptions of the antiquity and spread of maize to different regions of the Americas and provided evidence for the previously unknown presence of undomesticated teosinte genes (Chapter 6). Chapter 2 by Benz, on maize in the Americas, addresses some of these biological and chronological data and the underlying biases in previous research methodologies when maize was still believed to have multiple origins [13]. Several chapters present data derived from the latest advances in the study of maize origins—morphology and microfossil analysis—asking the question: What can such research on ancient maize tell us about the origin, history, and spread of this important cultigen? Chapters presenting evidence on the physical characteristics of archaeological maize remains also include an assessment of methodological approaches on microfossils in carbon residues that appear to provide greater detailed information on the identification and spread of ancient maize lineages (see Chapters 7, 9, 26, 27, 34, and 37). These chapters suggest that the future of maize research will be more heavily influenced by molecular biology, particularly the maize genome project, and botanical research on plant morphology, as scholars will attempt to quantify, identify, and trace those genes, traits, and morphological characteristics related to human as opposed to natural selection.

An economic staple throughout the Western hemisphere at the time of European contact, the evolution and spread of maize (*Zea mays* L.) have been topics of major archaeological research in the Americas for more than a century [1]. The second part of the volume deals with the stable carbon isotope analysis and paleodiet and directly addresses these previous concerns with direct quantitative evidence of its economic importance. Researchers working in areas ranging from as far afield as southern Canada and Argentina discuss the dietary, social, and economic implications of stable carbon isotope analyses from human skeletal remains (see Chapters 15 and 40). Research using strontium isotopes and elemental analyses of biochemistry involving human skeletons, as well as plants and animals, can now be used to determine whether people, plants, or animals were displaced or brought in from other areas or regions than where they were identified archaeologically. Strontium isotopic research is generating data that has facilitated our understanding of how maize was manipulated and used by ancient

societies and challenges our previous assumptions of how maize was dispersed and its role in the ancient economy (see Chapter 21).

In recent years, multidisciplinary research using a variety of new methods and techniques in stable carbon isotope analysis has clarified and provided detailed data on the dietary importance of maize in distinct cultural settings and time periods (see Chapter 10). Isotopic research on ancient human skeletons, particularly in the past decade, has greatly expanded our understanding of human adaptation, and in some cases, required maize specialists from the natural and social sciences to revise long-held theories on the spread and effects of maize on the development of sociocultural complexity. The section on stable carbon isotope analysis provides the most up-to-date results on paleodiet in the Americas. The summary by Henry Schwarcz (see Chapter 22) represents one of the most comprehensive treatments of these data in the published literature. Results from various contributions indicate that maize became a primary staple in the Americas much later than had been previously thought and that its role in sociocultural development is much more complex and varied in some regions of the Neotropics, particularly in the areas adjacent to where it was originally domesticated (see Chapter 13). In other regions of the Americas it became a food staple late in the prehistoric sequence, and in some regions its adoption and role in the ancient economy was highly varied, and it was never a primary staple (see Chapters 15, 16, 18, and 19). These data provide refreshing and informative insights into the spread and economic importance of maize, and in many ways they challenge our previous assumptions of its importance and role in sociocultural development.

The chapters in Parts III to IV are organized chronologically by geographic region going from the earliest evidence for maize domestication to its later spread into other areas of the hemisphere. Considerations of the scientific, theoretical, and methodological approach also influenced the organization of this volume. The geographic and topical divisions are in two parts: Part III: Central and South America and Part IV: North America and Northern Mexico. Many recent scientific advances in our knowledge surrounding the increasing dependence on plant domestication and particularly the role of maize in ancient economies are explored in these chapters. Most of the research is archaeological and many contributions incorporate the most recent multidisciplinary evidence to build consensus on primary issues surrounding maize science that are based on internally consistent lines of evidence. The innovative and original approaches presented in this volume provide a basis for the future of multidisciplinary research on this important New World cultigen.

Part III represents a natural extension of the first parts of the volume in its multidisciplinary research and geographic and chronological breadth and scope and is distinguished to some extent in that the research primarily concerns the social sciences—the ethnohistory, archaeology, and contextual associations of ancient maize. Numerous ethnohistoric documents and ethnographic accounts are presented to examine the social and symbolic significance of maize to sociocultural development. Ethnohistoric accounts generally emphasized maize as the preeminent grain of the Pre-Hispanic New World, a plant that was critical to sociocultural developments in Mexico and Central and South America at the time of contact. These accounts were largely biased by the importance of cereal grains in the Old World and have long influenced archaeological assumptions regarding the economic role of maize in Native American economies. In exploring little known ethnohistoric accounts of Native Andean speakers one of the contributions has uncovered evidence that suggests that maize also played a major role in cultural perceptions of hierarchy and status and that its role in the economy went far beyond dietary considerations (see Chapter 32).

Recent multidisciplinary lines of evidence have recorded the changing role of maize to sociocultural development in different chronological, geographic, and cultural settings. The ethnographical, ethnohistorical, paleobotanical, and archaeological evidence presented in these chapters has generated even more detailed evidence of complex sets of data regarding the phylogeny, chronology, evolution, and the sociocultural and socioeconomic significance of this important New World cultigen. The different social and symbolic roles maize played are explored in diverse chronological and cultural settings (see Chapters 31, 34, and 35). Other chapters, emphasize the significance of Native American practices regarding maize agriculture. The intercropping of the maize, beans, and squash triad is examined from an agronomic perspective, and the spread of maize lineages is traced through time and space (see Chapters 38–40). Some contributors trace the early movements of maize into the American Southwest and northern Mexico and provide innovative and original insights into its role in sociocultural development and adaptation (see Chapters 33 and 35).

The linguistic section of this volume, Part V, takes the reader back into Americanist anthropological science. The chapters presented here are multidimensional in scope and comprehensive in the regions covered. Some contributors use historical linguistics such as glottochronology to explore the dispersal of this plant among the widely dispersed Siouan language family in North America and the multibranched language families (Mayan, Mixe–Zoquean, Oto–Manguean, and Uto–Aztecan) and language groups of Mesoamerica (see Chapters 41 and 46). Cecil Brown (see Chapter 47) uses linguistic analysis to trace the spread of the terminology surrounding maize by various Native linguistic groups throughout the hemisphere. Moreover, the results from this ambitious contribution indicate that such data are largely consistent with the most current chronological evi-

dence of its spread. These contributions emphasize the importance of historical linguistics and language to our understanding of the antiquity, meaning, and the roles of maize in widely dispersed and economically diverse cultures.

Some linguistic contributors examined the vocabularies surrounding the cultivation and preparation of maize to correlate them with established archaeological dates for their introduction with linguistic developments, whereas others analyzed indigenous folk taxonomies to explore the meaning and uses of maize among ethnographic cultures and by extension their ancient ancestors (see Chapters 44 and 45).

Brian Stross (Chapter 42) analyzes images of maize, depicted in iconography, discussed in narratives, and stylized in glyphs, to gain an understanding of the ideological and mythological significance that this plant had to Mayan civilization. Alcorn, Edmonson, and Hernández Vidales (see Chapter 43) explore the mythological origins and cultural significance of maize as it is expressed in language and revealed in legend and song of the Teenek (Huastec) of San Luis Potosi and Veracruz, who are currently residing in the moist tropical forests and dry forest zones on the eastern side of the Sierra Madre Oriental. In prehistoric times they also lived along the Gulf Coast up through Tamaulipas and into the dry areas west of the mountains—including the area of the cave where teosinte and small maize ears were discovered by Richard MacNeish decades ago.

The ethnographic and linguistic evidence presented in this part of the volume represent an affirmation of American anthropological science, and as Gordon Willey and Philip Phillips [23] once said, "archaeology is anthropology or it is nothing at all" [p. 2]. The linguistic chapters are in this part of the volume to emphasize the anthropological roots of American archaeology and reaffirm what was stated at the beginning of this introduction. It has only been a decade since the last important landmark synthesis on maize science was published, but as these chapters clearly indicate, much has changed and been redefined regarding the spread and significance of maize in that short period of time [10].

In the volume summary, Benz and Staller (see Chapter 48) explore the multidisciplinary research on maize in different regions of the Americas to show how the data presented in this volume are in some cases a natural extension of the previous results, and in other ways a dramatic departure with conclusions and data that directly challenge the conventional wisdom and provide compelling evidence to suggest that many of our current assumptions and preconceptions are no longer tenable. This final statement on the volume and maize science reaffirms the power of integrating multiple lines of internally consistent data in light of the previous claims and assumptions that have been made in the important and often controversial history of research on maize.

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