Kernels of Culture

Maize Around the World

May 3, 2024 to March 31, 2025

Stephen and Peter Sachs Museum

Missouri Botanical Garden
St. Louis, Missouri

MISSOURI BOTANICAL GARDEN

WLBC
The William L. Brown Center

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Maize Around the World

Where did the grass species Maize (*Zea mays)* we know and enjoy come from? Maize has a complex story from which we are continuing to reap the benefits every day. It begins thousands of years ago with the first Indigenous farmers in Mexico and Central America who selected these plants continuously, domesticating the kernels of teosinte—the acknowledged wild grass ancestor to maize—to the corn ears we grow and use today. The story continues with the Spanish and other European colonizers who brought maize to other parts of the world where it was quickly adopted in the 1500s, growing to become one of the top three cereal crops globally. Our knowledge of maize has grown from the work of botanists who have spent many years untangling the origins of this crop, including those who are working on the genetic possibilities of this complex grass species into the future.

Thanks to all of these contributors, collaborators, and supporters to the Sachs Museum's exhibition and programs who shared their expertise, passion, and creativity on maize, art, farming, foods, community, tools, and pop culture.

Nezka Pfeifer, Museum Curator, Stephen and Peter Sachs Museum

Grateful thanks to Nancy Ridenour for sponsorship of the artwork commissions in the exhibition.

Artists Waleska Font and Megan Singleton

Contributors of research and lenders of objects and images to the exhibition: Dr. Katie Murphy and Clara Lebow, Danforth Plant Science Institute; Dr. Sherry Flint-Garcia, Susan Melia-Hancock, and Miriam Nancy Salazar Vidal, USDA-ARS and University of Missouri Columbia; Kristina Hampton, Saint Louis Science Center; Dr. Susan Kooiman and Regina Fairbanks; Elyse Zorn Karlin, John Nels Hatleberg, Tom Herman; Ralph Haynes and Pinckney Bend Distillery; Dr. Michael Kotutwa Johnson, Dail Chambers, Brooke Rice and Martin Loft; Arizona State Museum: University of Arizona; Carolina Holtmeyer, Sandra Giger, Viva Brasil StL; Shannon Hoch, Marilyn Lanning, Missouri Meerschaum Company; Missouri Historical Society, St. Louis, Photographs and Prints Department.

Dr. Jessica Moore Harjo of Weomepe Designs for the design expertise, Andi Kur for the illustrations, and Virginia Harold for installation photography.

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Dr. Peter Wyse Jackson, Dr. Jordan Teisher, Lauren Boyle and Victoria Patrick; Dana Kelly and Jim Kuchar; Dr. Carmen Ulloa Ulloa; Dr. Robbie Hart, Charlie Miksicek, Dr. Kate Farley, Carolina Romero, and Aurora Prehn; Heidi Schmidt; Fred Gauna, Tad Yankoski, and Chris Hartley; Mitzi Streeter and Michael Ritchie; Jennifer Wolff and Emily Spuhler; Linda Fiehler, Susie Ratcliff, John Steinmetz, and Rowen Conry.

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@mobotmuseum #KernelsOfCulture

We are very proud to have the restored Stephen and Peter Sachs Museum at the Missouri Botanical Garden as a wonderful asset for visitors and an important venue for exhibitions. The historic building is a unique setting to highlight many diverse aspects of the Garden's mission, focusing on the importance of plants and their use, history, and fascination.

We are pleased to present this exhibition on Maize, which is one of the world's most important global crops, with a history of use in the Americas for thousands of years. We chose this topic because of a deep connection between maize research and the Garden over many years. The Garden's Herbarium contains the Anderson-Cutler Maize Collection, largely collected during the first half of the twentieth century. This historic collection includes seeds of teosinte, the wild ancestor of modern corn, as well as thousands of ears of maize varieties from North America, Mexico, Central America, the Caribbean, South America, and some from Europe, Asia, and Africa collected by botanists such as Hugh Cutler and Edgar Anderson.

Today, maize is part of the daily lives of billions who rely on it to feed themselves, their families, their animals. It is also such a versatile crop that it can be used in many applications, including biofuel and as additives in items we use every day. Maize is genetically fascinating and visually appealing—as well as very tasty! I hope you will enjoy exploring the diversity of this amazing plant.

Dr. Peter Wyse Jackson

The Anderson-Cutler Maize Collection at Missouri Botanical Garden

The Missouri Botanical Garden houses an impressive historical collection of maize varieties, featuring over 6,400 ears of maize, numerous vials of seeds, herbarium specimens, and documentary records. This extensive collection has been assembled over the last century, largely due to the efforts of Edgar Anderson, a distinguished botanist, scientist, teacher, and former director of the Missouri Botanical Garden, and Hugh Cutler, his student at Washington University in St. Louis who later became a scientist and leader at the Garden himself.

Anderson and Cutler embarked on a long-term collaborative project to map the diversity of maize varieties, explore their relationships, and uncover the history of maize domestication. A significant portion of the collection, especially varieties from regions such as Mexico, Peru, Bolivia, and the southwestern USA, was collected by Cutler. The collection grew internationally through contributions from other maize researchers, eventually encompassing varieties from around the globe.

Beyond its scientific value, this collection was intimately linked with farmers through crop diversity and improvement programs in collaboration with the US Department of Agriculture, the National Research Council, the Rockefeller Foundation, and Pioneer Seeds. William L. Brown, another of Anderson's students, was the first PhD scientist at Pioneer. The hybrid seed company was founded by Henry Wallace (a farmer and businessman who became Secretary of Agriculture and Vice President to Franklin Delano Roosevelt). Brown went on to lead Pioneer and maintained active collaboration on maize with the Garden. The seeds gathered by the USDA and Pioneer contributed to the Garden's collection, and constitute some of the oldest in the maize collection.

Today, this collection stands as a vital historical reference to the diversity of maize, an educational tool about its origins, and a bridge to reconnect collected varieties with the descendant communities of those who originally cultivated them.

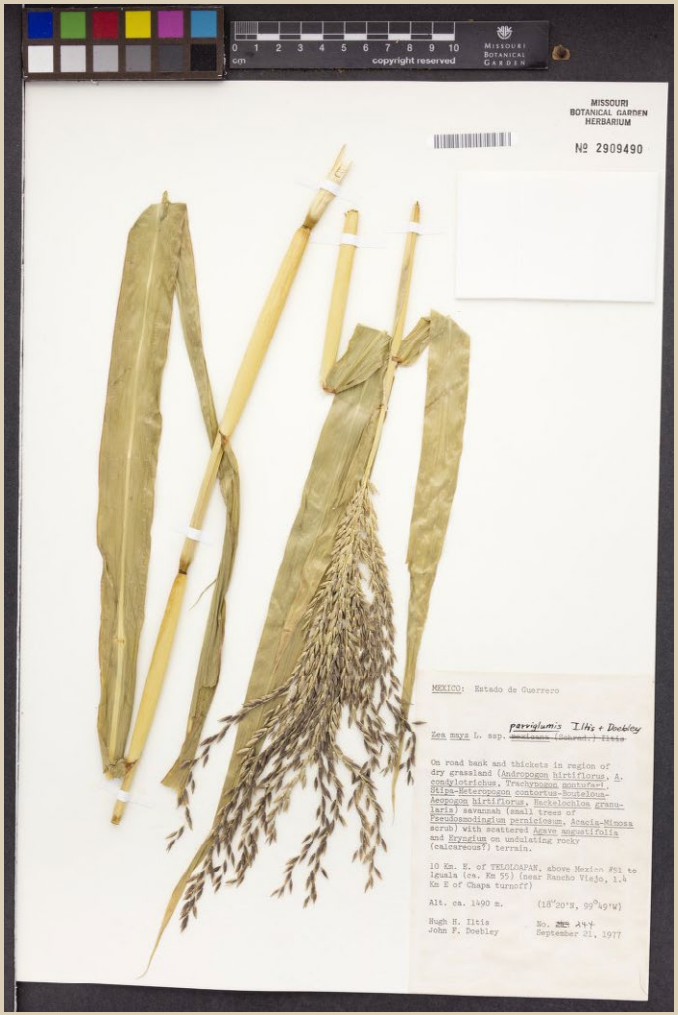
Dr. Robbie Hart, William L. Brown Curator of Economic Botany

The hybridization journey from teosinte to maize

These teosinte specimens visually illustrate very simply the process by which ancient Central Americans selected teosinte over thousands of years to become the maize with corn ears that we know today. Left to right, the domestication began with the teosinte kernels that easily separated when they matured, but then they mutated and the kernels became larger, pointy, and more like popcorn. Over the next mutations, the fruitcase disappeared and the ear appeared as the less fragile base for the kernels, and the kernels remained attached, rather than falling apart at maturity. Continual hybridization developed a stronger and more stable cob, with developments of a four-row ear and eventually an eight-row ear, that looks like a miniature version of the maize that we grow now.

Herbarium 6547088, 6547102, 6547091, 6547077, 6547095, 6547090

Illustration by Andi Kur Art



Zea mays subsp. ***parviglumis***
Balsas teosinte, Guerrero teosinte
Teloloapan, Guerrero, Mexico
Poaceae; Hugh H. Iltis; September 21, 1977
Courtesy of the Missouri Botanical Garden Herbarium, 2909490

Beginning around 9,000 years ago, humans began exploiting and cultivating populations of wild *Zea mays* subsp. *parviglumis* in the Balsas River Valley of Mexico. When maize moved into the Mexican highlands, it encountered the highland Mexican annual teosinte, *mexicana*, where maize and *mexicana* interbred. Maize exhibits reduced genetic diversity compared to its wild relatives, the teosintes; modern breeding efforts further diminished genetic diversity in most agricultural maize.

Zea mays subsp. ***mexicana***
Chalco teosinte, Centra-plateau teosinte, Nobogame teosinte
Chalco, Valley of Mexico, Mexico
Poaceae; Hugh H. Iltis; September 11, 1977
Courtesy of the Missouri Botanical Garden Herbarium, 2909495

Today, *Zea mays* subsp. *parviglumis* and subsp. *mexicana* grow as weeds near maize fields, where farmers tend to tolerate them. The farmers recognize the subspecies introduce vigor to the maize crop, and they both contributed to the domestication of maize. These teosinte subspecies are revered as the progenitor of corn, occupying a crucial place in Indigenous culture and beliefs. For many Indigenous societies in the Americas, maize is considered the mother of all people and is the paramount cultivated crop. The name ‘teosinte’ derives from the Nahuatl word ‘teōcintli,’ signifying sacred corn.

The Sacred Crop

Venezuelan multidisciplinary artist Waleska Font presents ***The Sacred Crop***, a vibrant exploration of the profound cultural and spiritual significance of corn in Pre-Columbian Latin America. ***The Sacred Crop*** begins by embarking the audience on a journey to the Inca culture, with ***Inti Raymi***. This piece captures the essence of the festival dedicated to the sun god, Inti, who was revered for his life-giving power, essential for the growth of corn.

Thanks to the wealth of documentation available on Aztec culture, the artist was able to craft three pieces based on its mythology. ***Cintéotl*** depicts the Aztec deity of maize and symbol of gender fluidity and duality. ***The Men of Corn*** and ***Sprouting Heart*** refer to the Aztec creation myth, where Quetzalcoatl, Tlaloc, and Cintéotl unsuccessfully attempted to create mankind using ash, mud, and wood, turning to corn for their fourth try, breathing life into the humans that inhabit the earth today. ***Sisterhood*** features the holy trinity of Huixtocíhuatl, Chalchiuhtlicue, and Chicomecóatl, in a tribute to the elements that converge in the creation of a tortilla.

The exhibit extends its narrative in ***Nakawe***, the Huichol great-grandmother creator who is responsible for the growth of vegetation, especially corn, the main crop and symbol of fertility that sustains the Wixáritari people. Finally, Waleska closes this series with a love letter to her Venezuelan roots in ***Ossema***, a tribute to the Yukpa god of corn. Through poetry and visuals, ***The Sacred Crop*** invites viewers to contemplate the spiritual representation of corn and the complex relationship between humans and the divine, through an explosion of color, mysticism and culture.

Waleska's dedication to poetry and its visual translations has led her to initiate projects like the Bilingual Poetry Program and LatinX Verse II, aimed at fostering creative writing among bilingual Latinx youth in Missouri. Drawing from her personal journey as an immigrant, she infuses her art with deep empathy for those grappling with the concepts of identity and belonging.

waleskafont.art | @wleskafont

Globally, the colonization of Indigenous peoples by Europeans has significantly impacted the health, cultural, and spiritual conditions and practices of Indigenous communities. The Indigenous people of the Americas have developed and preserved different varieties of maize over generations of cultivation. Black and Indigenous farmers continue to use this plant for food, in ceremonies and celebrations, and as medicine. The farmers featured in ***Kernels of Culture*** include Dr. Michael Kotutwa Johnson, Hopi Nation and Indigenous Resiliency Center (Arizona), Dail Chambers of Coahoma Orchards (St. Louis, MO), and Brooke Rice of the Kanien'kehá:ka Nation, Snipe Clan (Kahnawàke, Québec, Canada).

Dr. Michael Kotutwa Johnson holds a PhD in Natural Resources from the University of Arizona, a Master of Public Policy from Pepperdine University, and a B.S. in Agriculture from Cornell University. Dr. Johnson is a faculty member and Assistance Specialist within the School of Natural Resources and the Environment.

Dail Chambers is a visual artist, creative consultant, and grower. She is a community-focused farmer whose Coahoma Orchards is an urban orchard "direct action" dedicated to the cross-cultural heritage of Native and African people. Photos by Garden Senior Media Specialist Nathan Kwarta, a veteran video producer and photographer, who advances the mission of the Garden through the human lens.

Brooke Rice is a citizen of the Kanien'kehá:ka Nation, Snipe Clan, from the community of Kahnawake. Her interests include traditional food sovereignty, sustainable food systems, and Indigenous knowledge. Her dream is to maintain these knowledge systems by incorporating teachings from her Elders. Photos by Martin Akwiranoron Loft, who was born in Kahnawake, Mohawk Territory in 1960. He is a photographer, printmaker, and craftsperson.

Twined basketry doll
Quinault Nation, Pacific Northwest Coast
Maize husk and fiber, plant fiber; ca. 20th century
Courtesy of Saint Louis Science Center Collections; 24-0153

Salasca, Saraguro, and Otavalo corn husk dolls
Ecuador
Maize husk; ca. 20th century
Courtesy of Dr. Carmen Ulloa Ulloa Collection

Maize cob tureen
American
Ceramic; 20th century
Courtesy of Missouri Botanical Garden, The Little Shop Around the Corner

Cornstick cornbread pan
American
Cast iron; ca. 20th century
Courtesy of the Missouri Botanical Garden, Tower Grove House; 1900.0001.216b

Assorted corn cob pipes
Washington, Missouri
Corn cob, wood, acrylic; ca. 20th – 21st century
Courtesy of Missouri Meerschaum Company Collection

Maize is a uniquely versatile plant. Every part of the plant is usable—husks, stalks, pollen, cobs, kernels, and corn silks. The visual and aesthetic impact of maize, with its cobs and kernels, has been a symbol of power and prosperity since it first appeared on the ancient objects for feasting and religion in the cultures of Central and South America. As it moved into the diets and use of cultures around the globe, maize also became an inspiration for art and as a symbol to all peoples who benefitted from it every day.

Illustration by Andi Kur Art

Danforth Plant Science Center, St. Louis, Missouri
The Donald Danforth Plant Science Center is the world's number one plant science research institute, whose mission is to improve the human condition through plant science. Here, researchers study how to make maize (and other plant species) more tolerant to environmental stressors such as drought stress. To do so, researchers use automated imaging, including regular cameras and X-ray sensors, to measure visible plant traits—also called plant "phenotypes"—under different conditions. By understanding how roots, stems, and leaves grow and change under different environments, researchers can breed maize plants that are healthier, higher yielding, and preserve the environment.

US Dept. of Agriculture Ag Research Service, Columbia, Missouri
Dr. Sherry Flint-Garcia is a specialist in corn genetics and growing hundreds of varieties of maize at the Maize Farm in Columbia. She and her team have shared these corn ears to show the incredible spectrum of maize that is grown around the world and how maize varieties were adapted to grow at different latitudes, elevations, and climates. The rainbow spectrum of maize cobs depicted here were grown by Dr. Flint-Garcia and her team in 2023.

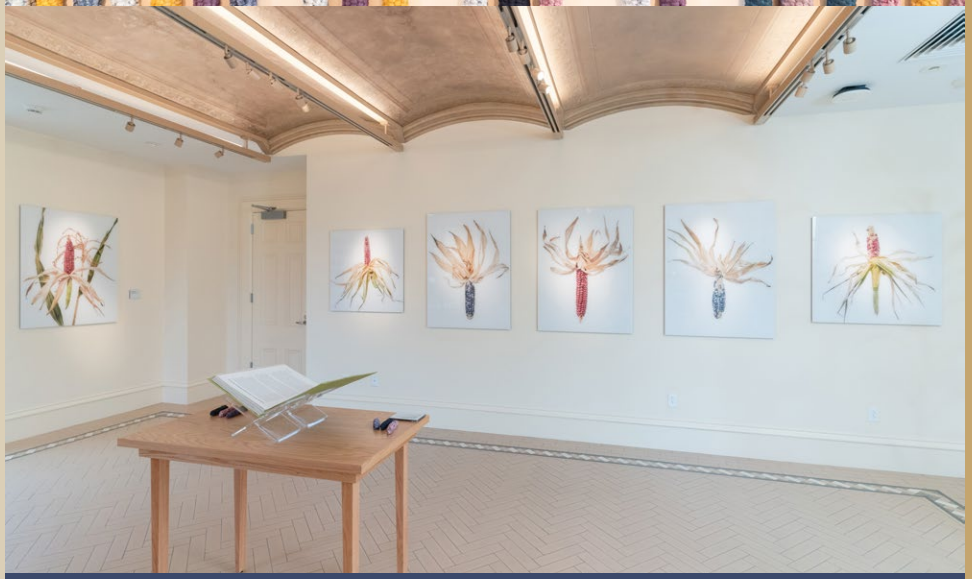
Transposable Elements: A Homage to Barbara McClintock and Hopi Zea mays

Megan Singleton

Intertwining her roles as citizen scientist, artist, and papermaker, Megan Singleton presents us with a new body of work investigating the connections between an innovative pioneering woman in corn science, Barbara McClintock, and the brilliant beauty of Hopi *Zea mays* (maize). In 2023, the Missouri Botanical Garden Horticulture team at the William T. Kemper Center for Home Gardening graciously grew a large plot of Hopi Turquoise and Hopi Purple maize for Singleton to use as material for her exhibition. Seeing the cobs striking color palette of indigo, purple, mauve, and blue that contrasted against the warm soft cream-colored husks inspired the artist's desire to showcase the exquisiteness of heirloom genetic diversity in corn plants.

In the search for the genetic sequence of these varieties, Singleton was introduced to the groundbreaking work of Nobel Prize winner Barbara McClintock (1902–1992), an expert in maize cytogenetics who researched the behavior of maize kernel color and produced the first genetic map of maize. McClintock then discovered transposition within the kernels' genes. She used this to demonstrate genes are responsible for turning physical traits on or off, such as the variety of coloration patterns on corn cobs. Later, this revelation changed the manner in which scientists think about genetic patterns of inheritance.

The genetic sequences of the Bz1 gene and C-gene were important and relevant to Barbara McClintock's work, as well as to the purple colors in the Hopi lines. Corn expert and scientist Katie Murphy explains, "The Bz1 gene encodes a protein that actually makes pigment colors, and its presence or absence determines whether there is none, brown, or purple pigment. The C-gene encodes a 'transcription factor'. I think of this as an on/off switch for other genes. When the C-gene is present and active, it will 'turn on' the Bz1 gene, among others. For an analogy, if Bz1 is the lightbulb, C is the light switch complete with the dimming function." The installation ***Anthocyanin*** uses cast paper cobs to depict the sequence of this C-gene. Other works in the exhibition include sculpture, installations using handmade paper and pulp made from the macerated corn fibers grown at the Garden, as well as photography and castings created using ears from the Hopi Turquoise and Hopi Purple plants.



Megan Singleton is a practicing artist and educator located in St. Louis, Missouri. Her ecology-based work crisscrosses the boundaries of contemporary craft, combining sculpture, hand papermaking, installation, and digital applications. She received her MFA in Sculpture from Louisiana State University and BFA in Photography from Webster University. Her work is actively exhibited, and she has been the recipient of numerous grants and artist residencies throughout the United States and Canada.

megansingleton.com

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Resilient Harvest
Camille Fields
5th grade
Dawn Lynn, Willow Brook Elementary
Marker and colored pencil on black and white photograph with construction paper and fibers, 2023

Lost In A Corn Maze
Ellie Bult
3rd grade
Catherine Jeltes, Little Flower School
Tempera and pencil, 2023

Corn
Cole Zastrow
1st grade
Kari Schepker-Mueller, MRH Early Childhood Center
Drawing, 2023

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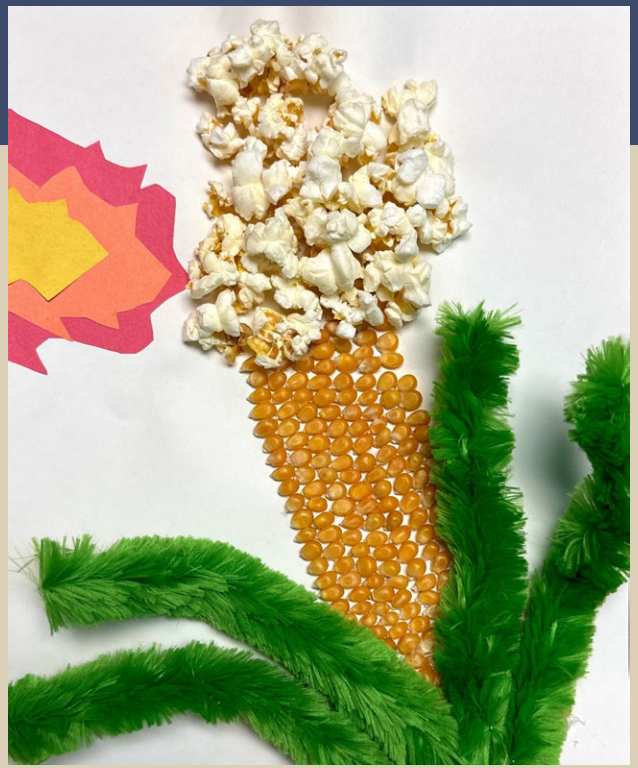
Magic Maze Popcorn
Ansley Bowers
3rd grade
Jami Heflin, Harvest Ridge Elementary School
Popcorn, kernels, pipe cleaners, construction paper, 2023

Food Truck
Joseph Rodriguez
7th grade
Emily Hemeyer, ArtScope STL; St. Frances Cabrini Academy
Colored pencil, 2023

As a complement to the global impact of maize—or as most people in the United States call it, corn—art teachers from participating schools and community art programs worked with their students, Kindergarten to 12th grade, to share their favorite ways to experience this phenomenal and versatile plant.



Back Cover:

Maize pendant
Hetian, China
Nephrite jade; ca. 20th century
Courtesy of Anonymous

Maize wedding ring
Thomas Herman, Seven Fingers Jewelers
14K gold; ca. 2002
Courtesy of Rosemary and James Herman

Corn earrings
Jack LiBuono, Jacques Costume Jewelry
Base metal, rhinestones, pearls; ca. 1960s or 1970s
Courtesy of Elyse Zorn Karlin

Pearl Corn Cob
John Nels Hatleberg
Historic Peruvian pearls, opals, 24K gold leaf, 18K gold wire; ca. 2024
Courtesy of John Nels Hatleberg