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Legacy of the Columbian Exchange

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Preface

The year 2022 is the 50th anniversary of Alfred Crosby's landmark book – *The Columbian Exchange: Biological and Cultural Consequences of 1492*. In this book, he was the first to discuss the impact that the Spanish and Portuguese colonial period had on world agriculture and human culture. How the crops of the world became homogenized, and how an indigenous culture was destroyed by disease after Columbus landed. As Crosby stated it (p. 3): "The two worlds, which God had cast asunder, were reunited, and the two worlds, which were so very different, began on that day to become alike. That trend toward biological homogeneity is one of the most important aspects of the history of life on the planet since the retreat of the continental glaciers."

Crosby's work was truly groundbreaking. His work did not fit the traditional pigeonholes of a scientific discipline. It was a broad interdisciplinary effort, marrying biological, economic, and social sciences. In his book, he established a whole new scientific discipline—Environmental History. As Harvard University professor Joyce E. Chaplin described in a *Washington Post* obituary in 2018: "Before his work, people tended to think that the environment only had really dramatic effects on humans in the modern era, and especially through disasters. Crosby pointed out an older history, showing how plants and animals, especially disease microbes, had radically changed human lives before the modern era." As Crosby put it in an essay: "Humanity turned out to be the purposeful but often drunken ringmaster of a three-ring circus of organisms"

Perhaps most importantly, Crosby showed that world affairs are not driven just by strong personalities and powerful armies, but by a country's natural resources and trade. Power comes from the successful acquisition and trade of desired commodities. The fundamental role that crops and livestock play in obtaining that power cannot be underestimated. We often talk of the importance of natural resources like oil and precious metal in the acquisition of power, but it is more often a function of the crops that are available for trade.

After 50 years, Crosby's observations have stood the test of time and remain rock solid. There have been minor quibbles concerning the importance of Columbus's impact and his emphasis on the Spanish vs Portuguese roles in crop dissemination,

but there can be little argument about his central premise that the arrival of the Iberians was a collision that dramatically changed the world. Several recent critically acclaimed books have been clearly inspired by Crosby's books, including Jared Diamond's *Guns, Germs and Steel* and Thomas Mann's *1491* and *1493*.

The intent of my book is not to revisit Crosby's main points but rather to build on what he so succinctly and brilliantly presented. His landmark study broke new ground in its broad conceptualization of the Atlantic exchange; however, as Gade (2015) points out: "Crosby provided little information about timing, direction of movement of specific biotic material or the difference between intent and success. In Crosby's account, only the destination, not the journey, mattered." My goal is to present information that has emerged since his books' original publication that more fully discuss the development of crops and agriculture before and after the Iberian contact. I also cover the development of agriculture in North America after 1492 and the extensive Eastern trade routes of the Europeans—topics largely ignored by Crosby.

Chapter 1 discusses the origin of world crops and agriculture and sets the stage for the rest of the book. The separation of the two Worlds is highlighted, and the major crops of the New and Old Worlds are introduced.

Chapters 2 and 3 describe the distinctiveness of the agriculture of the Europeans and Amerindian cultures before the Columbian Encounter. The crops and livestock of Europe had arrived there in two waves. One from the north that had traveled from the Near East Center by cultural diffusion and another from the south that arrived much later and was carried directly by the Muslims as they moved across North Africa to Spain. The agriculture of the New World radiated out from Meso and South America and by the Columbian Encounter had spread across most of the Americas from central south America to the Atlantic Seaboard of North America. Essentially the same assemblage of crops was being grown by the great Inca and Aztec Societies of Meso- and South America, and the less organized Taino and Tupi cultures of the Caribbean and coastal Brazil.

Chapters 4, 5, and 6 review the Spanish conquest and colonization of the Americas and the societal changes brought on by that interaction. The Spanish brought with them the whole European agricultural complex which they tried to fully incorporate into the New World. The establishment of their crops and livestock was dependent on local climatic conditions and the agriculture of the Americas became a blend of the Old and New World. The Spanish forced the indigenous people of the Americas to labor on their farms and mines, and these unfortunate peoples were hit with numerous epidemics which decimated their populations.

Chapter 7 discusses the Portuguese invasion and conquest of Brazil. Their pattern of colonization varied greatly from that of the Spanish as there were no great empires to conquer. The Portuguese first viewed Brazil as a trading center but soon established large plantations of sugar and then coffee and cocoa. For their workforce, they imported slaves from Africa, finding it easier than subjugating the local, unwilling Tupi. European crops proved poorly adapted to the tropics of Brazil, and the colonists came to rely on a combination of local crops and those brought from Africa by the slaves.

Chapter 8 talks about the trade routes across the Indian Ocean and China Seas that emerged from Europe after 1492. The conquest of East Africa, India, and Southeast Asia by the Portuguese and Spanish is first discussed, followed by a description of the later push of the English and Dutch. It was along these trade routes that the New World crops were scattered across the four corners of the world. Chapter 8 also describes the European colonization of eastern North America, and how northern and southern styles of agriculture emerged using different arrays of New and Old World crops and livestock.

Chapter 9 follows the introduction of individual American crops into the Old World, first to Europe and then Africa, Southeast Asia, and China. All the New World crops found a new home somewhere in the western hemisphere, although their rate of acceptance varied widely. Maize was the fastest and widest distributed New World crop. Manioc took Africa by storm soon after its introduction but didn't spread further until the nineteenth century. Potato was slow to take hold in Europe, but by the late 1600s its establishment led to a population boom. Chili peppers were almost an instant hit in southeast Asia, while tomatoes ground slowly toward ultimate acceptance in Europe. The fruits guava and agave became so quickly and widely established in the tropics of Africa and Southeast Asia that by the 1800s European botanists forgot that they were American in origin.

Chapter 10 sums up the story of the Columbian Exchange by describing the world today, in which the crops from the two hemispheres have become fully integrated. The chapter documents how the world was turned upside down by the European Encounter and how most people now rely on crops that arrived in their hemisphere only a few hundred years ago. A clear trend toward biological homogeneity is now apparent that is, as Crosby suggested, "one of the most important aspects of the history of life on the planet since the retreat of the continental glaciers."

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Chapter 1
Introduction

Crosby (1972) begins his landmark book with the following:

> On the evening of October 11, 1492, Christopher Columbus on board the Santa Maria in the Atlantic Ocean, thought he saw a tiny light in the distance. A few hours later, Rodrigo De Trianna, lookout on the Pinta's forecastle sighted land. In the morning a party went ashore. Columbus had reached the Bahamas. The connection between the Old and New Worlds, which for more than 10 millennia had been no more than a tenuous thing of Viking voyages, drifting fisherman and shadowy contacts of Polynesia, became on the twelfth day of October 1492 a bond as significant as the Bering land bridge had once been. The two worlds, which God had cast asunder, were reunited and the two worlds, which were so very different, began on that day to become alike. The trend toward biological homogeneity is one of the most important aspects of the history of life on this planet since the retreat of the continental glaciers.

When Columbus discovered the New World in 1492, he stumbled onto a totally unique set of crops unknown to Europeans. The main crops of the local Taino's of the Caribbean were cassava, maize, potato, beans, gourds, tomatoes, and chili peppers, while those of the Europeans were primarily wheat, cabbage, onions, garlic, and carrots. Remarkably, two completely different crop assemblages had been domesticated in the two hemispheres.

Perhaps even more astonishing was that the crops being grown by the Taino's in the Caribbean and the Spanish in Europe had themselves been originally domesticated in the far side of each hemisphere (Piperno 2011; Zeder 2011). Those farmed by the Taino's traced back 10,000 years to Central and South America where they originated, and the wheat grown by the Spanish had been domesticated in the "Fertile Crescent" of ancient Syria and Iran about 12,000 years previously. The other European crops had come from Southwest Asia, China, and Africa. The crop assemblages grown by the Taino's and Spanish had slowly but surely marched across each hemisphere over thousands of years.

Another startling difference in the agriculture of the West and East was the almost total absence of domestic animals in the Americas. While dogs, pigs, horses, cows, and chickens were commonplace in Europe, the Amerindians had only dogs,

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guinea pigs, turkeys, llamas, and alpacas. Only dogs were common to both hemispheres and likely followed late Pleistocene humans that crossed the Bering Strait from Asia (Leonard et al. 2002). It is no wonder that the Mayas, Incas, and Aztecs were filled with fear at the sight of conquistadors on horseback.

In 1492, the two hemispheres had been apart for 200 million years and over that time had evolved distinct flora and fauna. The peoples inhabiting the two hemispheres had also been isolated for about 20,000 years since the first migrants had crossed the Bering Strait. The people residing in the two hemispheres came to invent agriculture within a couple thousand years of each other but could only domesticate the unique species available to them. Thus, the people in the Old and New Worlds came to subsist on different crop and livestock assemblages (Fig. 1.1).

The worldwide distribution of crops and livestock was thrown upside down when the Portuguese and Spanish began to introduce their crops to the New World during colonization (Crosby 1972). A complete homogenization of world crops began with Columbus. He and other conquistadors and explorers brought back to Europe, a wide range of crops including potato, chili pepper, and maize originally from Mesoamerica, and tomato, beans, cassava, cocoa, and groundnuts domesticated in South America. The Spanish also took maize, sweet potato, and groundnut to the Philippines, and from there they ultimately found their way to China.

During the period of colonization of the Americas, the European settlers tried to transfer the entire European agricultural system to the New World, with varying levels of success. In Mesoamerica, Central America, and the Andean region, the Spanish introduced barley, chickpea, cucumber, fig, and wheat, which were originally domesticated in the Near East, citrus, pear, and peach from China, melons

Fig. 1.1 Map of the Columbian exchange. (Original image by 4.0., B. C. B. (2022, April 24). World History Encyclopedia. Retrieved from https://www.worldhistory.org/image/15707/the-columbian-exchange-map/)

from Africa, and cabbage, lettuce, grapes, and onions from the Mediterranean. The Europeans also introduced pigs, cattle, and horses wherever they landed, which proved widely adapted and often proliferated freely. Pigs, came to overrun the Caribbean, numbering in the tens of thousands.

The Portuguese also introduced a wide array of European crops into Brazil, including chickpea, faba bean, fig, and wheat from the Near East, sugar cane and banana from South-East Asia, peach and citrus from China, sorghum from Africa, and grapes from the Mediterranean. In the late 1600s, the English and French also introduced the full array of European crops to North America and brought back sunflower and the wild strawberry.

Today, the people of the earth are often dependent on crops originally domesticated at far off locations. Europe and North America now rely on a hodgepodge of worldwide crops, including wheat and barley domesticated in Near East, maize from Mesoamerica, potatoes from South America, and soybean from China. The African's original sorghum, millet, and yam have been largely displaced by maize from Mesoamerica, cassava and sweet potato from South America, and banana from South-East Asia. The original Chinese crops of rice and soybean have remained important in China, but they now are grown with Mesoamerican maize, and South American sweet potato and potato.

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Chapter 2
Origins of World Crops and Livestock

2.1 Peopling of the World

Millions of years ago, continental drift carried the Old World and New Worlds apart, splitting North and South America from Eurasia and Africa. This long separation between continents allowed the flora, fauna, and diseases of the eastern and western hemispheres to diverge dramatically.

North America was probably first reached by people from Siberia who crossed the Bering Strait on the land bridge exposed during the last great ice age (Fig. 2.1; Marshall 2001). The first unquestioned remains of humans in Alaska date to about 14,000 years ago, but a much earlier arrival of humans is likely. The movement may have been enticed by a much milder climate than we know today. Once people arrived in the New World, they spread out rapidly, leaving fossil evidence all over North America and reaching the tip of South America by 14,000 years ago, a migration rate of almost 16 km a year.

It is also possible that some people arrived in North and South America by routes other than the Bering Strait (Dillehay 2000; Marshall 2001). Ancient human skulls have been found in Brazil, Middle America, and the Pacific North-West that resemble those of South Asians, Polynesians, and even African bushmen. If this is true, some early Americans must have arrived by canoe from Asia and/or Europe, hugging the frozen coastlines of North America to the beyond.

As people spread across the world, they learned to use the resources available around them and became specialized hunters and gatherers. In some parts of Europe, people were primarily big-game hunters who followed a diverse array of herd species, including deer, pig, cattle, horses, elk, and foxes. In other parts of Europe, people were more stationary, relying on fishing for the bulk of their calories. Along the coasts of both the New World and the Old, people collected shellfish. Across broad expanses of western parts of California and northern Mexico, people became specialized gatherers of plant food. Hunter–gatherers in Iraq relied on a

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