Columbian exchange

The **Columbian exchange**, also known as the **Columbian interchange**, named after Christopher Columbus, was the widespread transfer of plants, animals, culture, human populations, technology, diseases, and ideas between the Americas, West Africa, and the Old World in the 15th and 16th centuries. It also relates to European colonization and trade following Christopher Columbus's 1492 voyage.[1] Invasive species, including communicable diseases, were a byproduct of the exchange. The changes in agriculture significantly altered global populations. The most significant immediate impact of the Columbian exchange was the cultural exchanges and the transfer of people (both free and enslaved) between continents.

New World native plants. Clockwise, from top left: 1. Maize (*Zea mays*) 2. Tomato (*Solanum lycopersicum*) 3. Potato (*Solanum tuberosum*) 4. Vanilla (*Vanilla*) 5. Pará rubber tree (*Hevea brasiliensis*) 6. Cacao (*Theobroma cacao*) 7. Tobacco (*Nicotiana rustica*)

Old World native plants. Clockwise, from top left: 1. Citrus (Rutaceae); 2. Apple (*Malus domestica*); 3. Banana (*Musa*); 4. Mango (*Mangifera*); 5. Onion (*Allium*); 6. Coffee (*Coffea*); 7. Wheat (*Triticum* spp.); 8. Rice (*Oryza sativa*)

The new contacts among the global population circulated a wide variety of crops and livestock, which supported increases in population in both hemispheres, although diseases initially caused precipitous declines in the numbers of indigenous peoples of the Americas. Traders returned to Europe with maize, potatoes, and tomatoes, which became very important crops in Europe by the 18th century.

The term was first used in 1972 by American historian Alfred W. Crosby in his environmental history book *The Columbian Exchange*.[2] It was rapidly adopted by other historians and journalists and has become widely known.

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Origin of the term

In 1972 Alfred W. Crosby, an American historian at the University of Texas at Austin, published *The Columbian Exchange*.[2] He published subsequent volumes within the same decade. His primary focus was mapping the biological and cultural transfers that occurred between the Old and New World. He studied the effects of Columbus' voyages between the two – specifically, the global diffusion of crops, seeds, and plants from the New World back into the Old, radically transforming agriculture in both regions. His research made a lasting contribution to the way scholars understand the variety of contemporary ecosystems that arose due to these transfers.[3]

The term has become popular among historians and journalists, and since been enhanced with Crosby's later book in 3 editions, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*, which Charles C. Mann, in his book *1493* further expands and updates Crosby's original research.[4]

Influence

Crops

Inca-era terraces on Taquile are used to grow traditional Andean staples such as quinoa and potatoes, alongside wheat, a European introduction.

Several plants native to the Americas have spread around the world, including potato, maize, tomato, and tobacco.[5] Before 1500, potatoes were not grown outside of South America. By the 19th century they were consumed widely in Europe and had become important crops in India and North America. Potatoes eventually became an important staple of the diet in much of Europe, contributing to an estimated 25% of the population growth in Afro-Eurasia between 1700 and 1900.[6] Many European rulers, including Frederick the Great of Prussia and Catherine the Great of Russia, encouraged the cultivation of the potato.[7]

Portuguese trading animals in Japan; detail of Nanban panel (1570–1616)

Maize and cassava, introduced by the Portuguese from South America in the 16th century,[8] have replaced sorghum and millet as Africa's most important food crops.[9] 16th-century Spanish colonizers introduced new staple crops to Asia from the Americas, including maize and sweet potatoes, and thereby contributed to population growth in Asia.[10] On a larger scale, the coming of potatoes and maize to the old world "resulted in caloric and nutritional improvements over previously existing staples" throughout the Eurasian landmass[11] as they created more varied and abundant food production.[12]

Tomatoes, which came to Europe from the New World via Spain, were initially prized in Italy mainly for their ornamental value (see below). But starting in the 19th century, tomato sauces became typical of Neapolitan cuisine and, ultimately, Italian cuisine in general.[13] Coffee (introduced in the Americas circa 1720) from Africa and the Middle East and sugarcane

(introduced from the Indian subcontinent) from the Spanish West Indies became the main export commodity crops of extensive Latin American plantations. Introduced to India by the Portuguese, chili and potatoes from South America have become an integral part of Indian cuisine.[14]

Rice

Rice was another crop that became widely cultivated during the Columbian exchange. As the demand in the New World grew, so did the knowledge on how to cultivate it. The two primary species used were Oryza glaberrima and Oryza sativa, originating from West Africa and Southeast Asia respectively. Slaveholders in the New World relied upon the skills of enslaved Africans to further cultivate both species.[15] North and South Carolina were key places where rice was grown during the slave trade, and islands of the Caribbean like Puerto Rico and Cuba were equally great centers of production. Enslaved Africans brought their knowledge of water control, milling, winnowing, and other general agrarian practices to the fields. This widespread knowledge amongst enslaved Africans eventually led to rice becoming a staple dietary item in the New World.[3]

Fruits

Citrus fruits and grapes were brought to the Americas from the Mediterranean. At first these crops struggled to adapt to the climate in the New World but by the late 19th century they were growing more consistently.[16]

Bananas were introduced into the Americas in the 16th century by Portuguese sailors who came across the fruits while engaged in commercial ventures, primarily slavery, in West Africa. Bananas were still only consumed in minimal amounts as late as the 1880s. The U.S. did not see major rises in banana consumption until the establishment of banana plantations in the Caribbean.[17] The History of modern banana plantations in the Americas details the spread of this crop within the Americas.

Tomatoes

It took three centuries after their introduction in Europe for tomatoes to become widely accepted. Tobacco, potatoes, chili peppers, tomatillos, and tomatoes are all members of the nightshade family. All of these plants bear some resemblance to the European nightshade that even an amateur could deduce just by simple observation of the flowers and berries. Similar to some European Nightshade varieties, tomatoes and potatoes can be harmful or even lethal, if the wrong part of the plant is consumed at the wrong quantity. Of all the New World plants introduced to Italy, only the potato took as long as the tomato to gain acceptance. 16th-century physicians, thus, had good reason to be wary that this native Mexican fruit was poisonous and the generator of "melancholic humours". In 1544, Pietro Andrea Mattioli, a Tuscan physician and botanist, suggested that tomatoes might be edible, but no record exists of anyone consuming them at this time. On October 31, 1548, the tomato was given its first name anywhere in Europe when a house steward of Cosimo I de' Medici, Duke of Florence, wrote to the De' Medici's private secretary that the basket of *pomi d'oro* "had arrived safely". At this time, the label *pomi d'oro* was also used to refer to figs, melons, and citrus fruits in treatises by scientists.[18]

In the early years, tomatoes were mainly grown as ornamentals in Italy. For example, the Florentine aristocrat Giovan Vettorio Soderini wrote how they "were to be sought only for their beauty" and were grown only in gardens or flower beds. Tomatoes were grown in elite town and country gardens in the fifty years or so following their arrival in Europe and were only occasionally depicted in works of art. However, in 1592 the head gardener at the botanical garden of Aranjuez near Madrid, under the patronage of Philip II of Spain, wrote, "it is said [tomatoes] are good for sauces". Besides this account, tomatoes remained exotic plants grown for ornamental purposes, but rarely for culinary use. The combination of pasta with tomato

sauce was developed only in the late nineteenth century. Today around 32,000 acres (13,000 ha) of tomatoes are cultivated in Italy, although there are still areas where relatively few tomatoes are grown and consumed.[18]

Livestock

Initially at least, the Columbian exchange of animals largely went in one direction, from Europe to the New World, as the Eurasian regions had domesticated many more animals. Horses, donkeys, mules, pigs, cattle, sheep, goats, chickens, large dogs, cats and bees were rapidly adopted by native peoples for transport, food, and other uses.[19] One of the first European exports to the Americas, the horse, changed the lives of many Native American tribes. The mountain tribes shifted to a nomadic lifestyle, as opposed to agriculture, based on hunting bison on horseback and moved down to the Great Plains. The existing Plains tribes expanded their territories with horses, and the animals were considered so valuable that horse herds became a measure of wealth.[20]

The effects of the introduction of European livestock on the environments and peoples of the New World were not always positive. In the Caribbean, the proliferation of European animals had large effects on native fauna and undergrowth and damaged *conucos*, plots managed by indigenous peoples for subsistence.[21]

Mapuche of Araucanía were fast to adopt the horse from the Spanish, improving their military capabilities as the Arauco War raged between Spanish and Mapuches.[22][23] Until the arrival of the Spanish the Mapuches had had Chilihueque (Llama) livestock. The introduction of sheep caused some competition among both domestic species. Anecdotal evidence of the mid-17th century show that both species coexisted but that there were many more sheep than chilihueques. The decline of chilihueques reached a point in the late 18th century when only the Mapuche from Mariquina and Huequén next to Angol raised the animal.[24] In Chiloé Archipelago the introduction of pigs by the Spanish proved a success as they benefited from abundant shellfish and algae exposed by the large tides.[24]

Disease

Before regular communication had been established between the two hemispheres, the varieties of domesticated animals and infectious diseases that jumped to humans, such as smallpox, were substantially more numerous in the Old World than in the New due to more extensive long-distance trade networks. Many had migrated west across Eurasia with animals or people, or were brought by traders from Asia, so diseases of two continents were suffered by all occupants. While Europeans and Asians were affected by the Eurasian diseases, their endemic status in those continents over centuries resulted in many people gaining immunity.

Old World diseases had a devastating effect when introduced via European carriers, as the native people in the Americas had no natural immunity to the new diseases. Measles caused many deaths. The smallpox epidemics are believed to have caused the largest death tolls among Native Americans, surpassing any wars[25] and far exceeding the comparative loss of life in Europe due to the Black Death.[1]:164 It is estimated that upwards of 80–95 percent of the Native American population died in these epidemics within the first 100–150 years following 1492. Many regions in the Americas lost 100% of their indigenous population.[1]:165 The beginning of demographic collapse on the North American continent has typically been attributed to the spread of a well-documented smallpox epidemic from Hispaniola in December 1518.[21] At that point approximately only 10,000 indigenous people were still alive on Hispaniola.[21]

European exploration of tropical areas was aided by the New World discovery of quinine, the first effective treatment for malaria. Europeans suffered from this disease, but some indigenous populations had developed at least partial resistance to it. In Africa, resistance to malaria has been associated with other genetic changes

among sub-Saharan Africans and their descendants, which can cause sickle-cell disease.[1]:164 In fact, the resistance of sub-Saharan Africans to malaria in the southern United States and the Caribbean contributed greatly to the specific character of the Africa-sourced slavery in those regions.[26]

Similarly, yellow fever is thought to have been brought to the Americas from Africa via the Atlantic slave trade. Because it was endemic in Africa, many people there had acquired immunity. Europeans suffered higher rates of death than did African-descended persons when exposed to yellow fever in Africa and the Americas, where numerous epidemics swept the colonies beginning in the 17th century and continuing into the late 19th century. The disease caused widespread fatalities in the Caribbean during the heyday of slave-based sugar plantation.[21] The replacement of native forests by sugar plantations and factories facilitated its spread in the tropical area by reducing the number of potential natural mosquito predators.[21] The means of yellow fever transmission was unknown until 1881, when Carlos Finlay suggested that the disease was transmitted through mosquitoes, now known to be female mosquitoes of the species *Aedes aegypti*.[21]

The history of syphilis has been well-studied, but the exact origin of the disease is unknown and remains a subject of debate.[27] There are two primary hypotheses: one proposes that syphilis was carried to Europe from the Americas by the crew of Christopher Columbus in the early 1490s, while the other proposes that syphilis previously existed in Europe but went unrecognized.[28] These are referred to as the "Columbian" and "pre-Columbian" hypotheses.[28] The first written descriptions of the disease in the Old World came in 1493.[29] The first large outbreak of syphilis in Europe occurred in 1494/1495 in Naples, Italy, among the army of Charles VIII, during its invasion of Naples.[28][30][31][32] Many of the crew members who had served on the voyage had joined this army. After the victory, Charles's largely mercenary army returned to their respective homes, thereby spreading "the Great Pox" across Europe and triggering the deaths of more than five million people.[33][34]

Cultural exchanges

One of the results of the movement of people between New and Old Worlds were cultural exchanges. For example, in the article "The Myth of Early Globalization: The Atlantic Economy, 1500–1800" Pieter Emmer makes the point that "from 1500 onward, a 'clash of cultures' had begun in the Atlantic".[35] This clash of culture involved the transfer of European values to indigenous cultures. As an example, the emergence of the concept of private property in regions where property was often viewed as communal, concepts of monogamy (although many indigenous peoples were already monogamous,) the role of women and children in the social system, and the "superiority of free labor,"[36] although slavery was already a well-established practice among many indigenous people. Another example included the European deprecation of human sacrifice, an established religious practice among some indigenous populations.

When European colonizers first entered North America, they encountered fence-less lands. Seeking economic opportunity and homesteads, this indicated to them that the land was unimproved and available for the taking. When the English entered Virginia they encountered a fully established culture of people called the Powhatan. The Powhatan farmers in Virginia scattered their farm plots within larger cleared areas. These larger cleared areas were a communal place for growing useful plants. As the Europeans viewed fences as hallmarks of civilization they set about transforming "the land into something more suitable for themselves".[37] In implementing their practices, the Europeans enslaved, murdered, and exploited indigenous populations.

Tobacco was a New World agricultural product, originally a luxury good spread as part of the Columbian exchange. As is discussed in regard to the trans-Atlantic slave trade, the tobacco trade increased demand for free labor and spread tobacco worldwide. In discussing the widespread uses of tobacco, the Spanish physician Nicolas Monardes (1493–1588) noted that "The black people that have gone from these parts to

the Indies, have taken up the same manner and use of tobacco that the Indians have".[38] As Europeans traveled to other parts of the world they took with them the practices related to tobacco. Demand for tobacco grew in the course of these cultural exchanges among peoples.

One of the most clearly notable areas of cultural clash and exchange was that of religion, often the lead point of cultural conversion. In the Spanish and Portuguese dominions, the spread of Catholicism, steeped in a European value system, was a major objective of colonization, and was often pursued via explicit policies of suppression of indigenous languages, cultures and religions. In English North America missionaries converted many tribes and peoples to Protestant faiths, while the French colonies had a more outright religious mandate, as some of the early explorers, such as Jacques Marquette, were Catholic priests. In time, and given the European technological and immunological superiority which aided and secured their dominance, indigenous religions declined in the centuries following the European settlement of the Americas, although not without much conflict and uprisings of the indigenous peoples in defense of their cultural practices.

While Mapuche people did adopt the horse, sheep, and wheat, the over-all scant adoption of Spanish technology by Mapuche has been characterized as a means of cultural resistance.[22]

Atlantic slave trade

The Atlantic slave trade was the transfer of Africans from primarily West Africa to parts of the Americas between the 16th and 19th century, a large part of the Columbian Exchange.[39] About 10 million Africans arrived in the Americas on European boats as slaves. The journey that enslaved Africans took from parts of Africa to America is commonly known as the middle passage.[40] Today, millions of people in North America and South America, including the vast majority of the populations in the countries of the Caribbean, are descended from these Africans brought to the New World by Europeans.

Enslaved Africans were chained and bound before taken on ships to the New World

Enslaved Africans helped shape an emerging African-American culture in the New World. They participated in both skilled and unskilled labor and gave way to a new population which represented a hybrid of the two cultures.[39] *The Birth of African American Culture: An Anthropological Perspective* is a book written by Sidney Mintz and Richard Price further detailing the cultural impact of enslaved Africans in America. Mintz and Price's book helped to publicize how integral the socialization aspects of plantation life were to the structures of black culture.

The treatment of enslaved Africans during the Atlantic slave trade became one of the most controversial topics in the history of the New World. Slavery was abolished in 1865 in the United States and was ended in Brazil in 1888, but has remained a key subject in politics, pop culture and media.

Organism examples

Post-Columbian transfers of native organisms with close ties to humans

Type of organism	Old World to New World	New World to Old World
Domesticated animals	▪ cat (domestic – several wild species already present) ▪ cattle (Would have been used for meat, dairy, and for pulling a plow or wagon.) ▪ chicken ▪ donkey ▪ goat (the goats of the Old World, genus *Capra*, are different from the mountain goat of the New World, genus *Oreamnos*) ▪ goose (species of New World geese existed, but farmyards also would have wanted geese for laying eggs in addition to meat) ▪ guineafowl ▪ honey bee (European honey bee – other wild and domesticated species already present) ▪ horse ▪ rabbit (domestic) ▪ pig ▪ sheep (Domestic only. Wild bighorn sheep do not live east of the Mississippi River and would not be discovered until after most of the interchange was complete.) ▪ water buffalo	▪ alpaca ▪ guinea pig ▪ llama ▪ parrots (macaws, amazons, and conures live only in the New World; were occasionally pets.) ▪ Muscovy duck ▪ turkey

Cultivated plants	▪ adzuki bean
	▪ almond
	▪ aloe vera
	▪ apple
	▪ apricot
	▪ asparagus
	▪ baobab
	▪ banana (including cooking banana)
	▪ barley
	▪ basil
	▪ beetroot
	▪ black-eyed pea
	▪ *Brassica oleracea*-derived vegetables
	  ▪ broccoli
	  ▪ Brussels sprout
	  ▪ cabbage
	  ▪ cauliflower
	  ▪ collard greens
	  ▪ kale
	  ▪ kohlrabi
	  ▪ rapeseed
		▪ acai
		▪ *Acca sellowiana* (feijoa, pineapple guava, Brazilian guava, guavasteen)
		▪ *Annona glabra* (alligator apple)
		▪ *Annona reticulata* (custard apple)
		▪ agave
		▪ allspice
		▪ amaranth (as grain)
		▪ annatto
		▪ arracacha
		▪ arrowroot or *Maranta arundinacea*
		▪ avocado
		▪ black cherry
		▪ black walnut
		▪ blueberry (commercial

- breadfruit
- broad bean
- *Cannabis* (including hemp)
- cantaloupe
- carrot
- celery
- cherry
- chickpea
- cinnamon
- citrus (orange, lemon, etc.)
- coconut (brought from Asia to Caribbean)
- coffee
- common fig
- coriander (also known as *cilantro*)
- cucumber
- cumin
- eggplant (aubergine)
- *Ellis* (oil palm)
- fennel
- finger millet
- foxtail millet
- flax
- garlic
- ginger
- goji
- grape (wild species present as well)
- hazelnut
- hops
- jackfruit (brought from Asia to Caribbean)
- kiwifruit
- kola nut
- leek
- lentil
- lettuce
- mace
- mango
- mangosteen
- melon (watermelon, cantaloupe, honeydew, etc.)
- millet
- mint
- *Momordica charantia* (bitter melon)
- mung bean
- nutmeg
- oat
- okra
- olive
- onion
- opium poppy
- oregano

varieties)
- Brazil nut
- *Calathea allouia* (leren)
- *Canna indica* (achira)
- *capsicum* (bell pepper and chili pepper)
- cashew
- cassava (manioc, tapioca, yuca)
- chayote
- cherimoya
- chia
- coca leaf
- cocoa bean
- cotton (long-staple species)
- cranberry (large cranberry, or bearberry species)
- *cucurbits* (many squashes and gourds)
  - butternut squash
  - pumpkin
  - Hubbard squash
  - zucchini (courgette)
- *Eryngium foetidum* (culantro, Mexican coriander)
- guarana
- guava (common)
- *Helianthus* (sunflower)
- Jerusalem artichoke
- jicama
- maize (corn)
- *Manilkara zapota* (sapodilla)
- mashua
- *Opuntia ficus-indica* (prickly pear)
- *Oxalis tuberosa* (New Zealand yam)
- papaya
- passionfruit, fruit and flowers for

	▪ parsnip ▪ pea ▪ peach ▪ pear ▪ pearl millet ▪ persimmon (Asian species only) ▪ pistachio ▪ plum ▪ pomegranate ▪ proso millet ▪ radish ▪ raspberry ▪ rice ▪ rosemary ▪ rye ▪ sesame ▪ sorghum ▪ soybean ▪ spinach ▪ sugarcane and sugar beet ▪ tamarind ▪ taro ▪ turmeric ▪ turnip ▪ walnut (commercial varieties) ▪ wheat ▪ yam (sometimes misnamed "sweet potato")	gardens; multiple species. ▪ peanut ▪ pecan ▪ *Phaseolus vulgaris* (beans: pinto, lima, kidney, etc.) ▪ physalis (cape gooseberry) ▪ pineapple ▪ pitaya (dragon fruit) ▪ potato ▪ quinoa ▪ rubber ▪ soursop ▪ stevia ▪ strawberry (commercial varieties) ▪ sugar-apple ▪ sugar maple ▪ sweet potato ▪ tamarillo ▪ tobacco ▪ tomato ▪ tomatillo ▪ ulluco ▪ vanilla ▪ wild rice ▪ yerba mate ▪ yucca
Cultivated fungi	▪ *Agaricus bisporus* (button mushrooms, chestnut mushrooms, portobello mushrooms) ▪ cloud ear fungus ▪ enoki mushroom ▪ oyster mushroom (some varieties) ▪ *Rhizopus oligosporus* (tempeh) ▪ shiitake mushroom ▪ snow ear fungus ▪ truffle	▪ huitlacoche (corn smut) ▪ oyster mushroom (some varieties)
Infectious diseases	▪ bubonic plague ▪ chickenpox ▪ cholera ▪ diphtheria ▪ gonorrhea ▪ influenza ▪ leprosy ▪ malaria ▪ measles	▪ Chagas disease ▪ pinta ▪ syphilis (disputed)

	▪ mumps ▪ pertussis ▪ rubella ▪ scarlet fever ▪ smallpox ▪ tuberculosis ▪ typhoid fever ▪ typhus ▪ yaws ▪ yellow fever	

Later history

Plants that arrived by land, sea, or air in the times before 1492 are called archaeophytes, and plants introduced to Europe after those times are called neophytes. Invasive species of plants and pathogens also were introduced by chance, including such weeds as tumbleweeds (*Salsola* spp.) and wild oats (*Avena fatua*). Some plants introduced intentionally, such as the kudzu vine introduced in 1894 from Japan to the United States to help control soil erosion, have since been found to be invasive pests in the new environment.

Fungi have also been transported, such as the one responsible for Dutch elm disease, killing American elms in North American forests and cities, where many had been planted as street trees. Some of the invasive species have become serious ecosystem and economic problems after establishing in the New World environments.[41][42] A beneficial, although probably unintentional, introduction is *Saccharomyces eubayanus*, the yeast responsible for lager beer now thought to have originated in Patagonia.[43] Others have crossed the Atlantic to Europe and have changed the course of history. In the 1840s, *Phytophthora infestans* crossed the oceans, damaging the potato crop in several European nations. In Ireland, the potato crop was totally destroyed; the Irish Potato Famine caused millions to starve to death or emigrate.

In addition to these, many animals were introduced to new habitats on the other side of the world either accidentally or incidentally. These include such animals as brown rats, earthworms (apparently absent from parts of the pre-Columbian New World), and zebra mussels, which arrived on ships.[44] Escaped and feral populations of non-indigenous animals have thrived in both the Old and New Worlds, often negatively impacting or displacing native species. In the New World, populations of feral European cats, pigs, horses, and cattle are common, and the Burmese python and green iguana are considered problematic in Florida. In the Old World, the Eastern gray squirrel has been particularly successful in colonising Great Britain, and populations of raccoons can now be found in some regions of Germany, the Caucasus, and Japan. Fur farm escapees such as coypu and American mink have extensive populations.

See also

- Alfred W. Crosby
- Domestication
- Great American Interchange
- Glossary of invasion biology terms
- *Guns, Germs, and Steel*
- *Indian Givers: How the Indians of the Americas Transformed the World*
- List of food plants native to the Americas
- Population history of indigenous peoples of the Americas
- Pre-Columbian trans-oceanic contact theories

- Transformation of culture
- *1493: Uncovering the New World Columbus Created*
- *1491: New Revelations of the Americas Before Columbus*

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- Worlds Together, Worlds Apart (http://www.wwnorton.com/college/history/worlds-together-worlds-apart3/) by Jeremy Adelman, Stephen Aron, Stephen Kotkin, et al.
- Foods that Changed the World (https://web.archive.org/web/20150510082054/http://www.accessexcellence.org/RC/Ethnobotany/page5.php) by Steven R. King from the Wayback Machine
- The Columbian Exchange (http://www.shmoop.com/columbian-exchange/) video, study guide, analysis, and teaching guide

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