The Columbian Exchange

BY J.R. MCNEILL

Figure 1. The arrival of Christopher Columbus in the Americas marked the meeting of previously separate biological worlds.

Geologists believe that between 280 million and 225 million years ago, the earth's previously separate land areas became welded into a landmass called Pangaea. About 120 million years ago, they believe, this landmass began to separate. As this happened, the Atlantic Ocean formed, dividing the Americas from Africa and Eurasia. Over the course of the next several million years in both the Americas and in Afro-Eurasia, biological evolution followed individual paths, creating two primarily separate biological worlds. However, when Christopher Columbus and his crew made land in the Bahamas in October 1492, these two long-separated worlds were reunited. Columbus' voyage, along with the many voyages that followed, disrupted much of the biological segregation brought about by continental drift.

After Columbus' arrival in the Americas, the animal, plant, and bacterial life of these two worlds began to mix. This process, first studied comprehensively by American historian Alfred Crosby, was called the Columbian Exchange. By reuniting formerly biologically distinct land masses, the Columbian Exchange had dramatic and lasting effects on the world. New diseases were introduced to American populations that had no prior

experience of them. The results were devastating. These populations also were introduced to new weeds and pests, livestock, and pets. New food and fiber crops were introduced to Eurasia and Africa, improving diets and fomenting trade there. In addition, the Columbian Exchange vastly expanded the scope of production of some popular drugs, bringing the pleasures — and consequences — of coffee, sugar, and tobacco use to many millions of people. The results of this exchange recast the biology of both regions and altered the history of the world.

The flow from east to west: Disease

By far the most dramatic and devastating impact of the Columbian Exchange followed the introduction of new diseases into the Americas. When the first inhabitants of the Americas arrived across the Bering land bridge between 20,000 and 12,000 years ago, they brought few diseases with them. Why? For one reason, they had no domesticated animals, the original source of human diseases such as smallpox and measles. In addition, as they passed from Siberia to North America, the first Americans had spent many years in extreme cold, which eliminated many of the disease-causing agents that might have traveled with them. As a result, the first Americans and their descendants, perhaps 40 million to 60 million strong by 1492, enjoyed freedom from most of the infectious diseases that plagued populations in Afro-Eurasia for millennia. Meanwhile, in Asia and Africa, the domestication of herd animals brought new diseases spread by cattle, sheep, pigs, and fowl.

Soon after 1492, sailors inadvertently introduced these diseases — including smallpox, measles, mumps, whooping cough, influenza, chicken pox, and typhus — to the Americas. People who lived in Afro-Eurasia had developed some immunities to these diseases because they had long existed among most Afro-Eurasian populations. However, the Native Americans had no such immunities. Adults and children alike were stricken by wave after wave of epidemic, which produced catastrophic mortality throughout the Americas. In the larger centers of highland Mexico and Peru, many millions of people died. On some Caribbean islands, the Native American population died out completely. In all, between 1492 and 1650, perhaps 90 percent of the first Americans had died.

This loss is considered among the largest demographic disasters in human history. By stripping the Americas of much of the human population, the Columbian Exchange rocked the region's ecological and economic balance. Ecosystems were in tumult as forests regrew and previously hunted animals increased in number. Economically, the population decrease brought by the Columbian Exchange indirectly caused a drastic labor shortage throughout the Americas, which eventually contributed to the establishment of African slavery on a vast scale in the Americas. By 1650, the slave trade had brought new diseases, such as malaria and yellow fever, which further plagued Native Americans.

The flow from east to west: Crops and animals

Eurasians sent much more than disease westward. The introduction of new crops and domesticated animals to the Americas did almost as much to upset the region's biological,

economic, and social balance as the introduction of disease had. Columbus had wanted to establish new fields of plenty in the Americas. On his later voyages he brought many crops he hoped might flourish there. He and his followers brought the familiar food grains of Europe: wheat, barley, and rye. They also brought Mediterranean plantation crops such as sugar, bananas, and citrus fruits, which all had originated in South or Southeast Asia. At first, many of these crops fared poorly; but eventually they all flourished. After 1640, sugar became the mainstay of the Caribbean and Brazilian economies, becoming the foundation for some of the largest slave societies ever known. The production of rice and cotton, both imported in the Columbian Exchange, together with tobacco, formed the basis of slave society in the United States. Wheat, which thrived in the temperate latitudes of North and South America and in the highlands of Mexico, eventually became a fundamental food crop for tens of millions of people in the Americas. Indeed, by the late 20th century, wheat exports from Canada, the United States, and Argentina were feeding millions of people outside the Americas. It is true that the spread of these crops drastically changed the economy of the Americas. However, these new crops supported the European settler societies and their African slave systems. The Native Americans preferred their own foods.

Figure 2. Oranges, now a staple of the Florida economy, didn't grow in the Americas until after the arrival of Spanish explorers.

When it came to animals, however, the Native Americans borrowed eagerly from the Eurasian stables. The Columbian Exchange brought horses, cattle, sheep, goats, pigs, and a collection of other useful species to the Americas. Before Columbus, Native American societies in the high Andes had domesticated llamas and alpacas, but no other animals weighing more than 45 kg (100 lbs). And for good reason: none of the other 23 large mammal species present in the Americas before the arrival of Columbus were suitable for domestication. In contrast, Eurasia had 72 large animal species, of which 13 were suitable for domestication. So, while Native Americans had plenty of good food crops available before 1492, they had few domesticated animals. The main ones, aside from llamas and alpacas, were dogs, turkeys, and guinea pigs.

Of all the animals introduced by the Europeans, the horse held particular attraction. Native Americans first encountered it as a fearsome war beast ridden by Spanish conquistadors. However, they soon learned to ride and raise horses themselves. In the North American great plains, the arrival of the horse revolutionized Native American life, permitting tribes to hunt the buffalo far more effectively. Several Native American groups left farming to become buffalo-hunting nomads and, incidentally, the most formidable enemies of European expansion in the Americas.

Figure 3. The introduction of horses made hunting buffalo much easier for the Plains Indians.

Cattle, sheep, pigs, and goats also proved popular in the Americas. Within 100 years after Columbus, huge herds of wild cattle roamed many of the natural grasslands of the Americas. Wild cattle, and, to a lesser degree, sheep and goats, menaced the food crops of Native Americans, notably in Mexico. Eventually ranching economies emerged, based variously on cattle, goats, or sheep. The largest ranches emerged in the grasslands of Venezuela and Argentina, and on the broad sea of grass that stretched from northern Mexico to the Canadian prairies. Native Americans used the livestock for meat, tallow, hides, transportation, and hauling. Altogether, the suite of domesticated animals from Eurasia brought a biological, economic, and social revolution to the Americas.

The flow from west to east: Disease

In terms of diseases, the Columbian Exchange was a wildly unequal affair, and the Americas got the worst of it. The flow of disease from the Americas eastward into Eurasia and Africa was either trivial or consisted of a single important infection. Much less is known about pre-Columbian diseases in the Americas than what is known about those in Eurasia. Based on their study of skeletal remains, anthropologists believe that Native Americans certainly suffered from arthritis. They also had another disease, probably a form of tuberculosis that may or may not have been similar to the pulmonary tuberculosis common in the modern world. Native Americans also apparently suffered from a group of illnesses that included two forms of syphilis. One controversial theory asserts that the venereal syphilis epidemic that swept much of Europe beginning in 1494 came from the Americas; however, the available evidence remains inconclusive.

The flow from west to east: Crops and cuisine

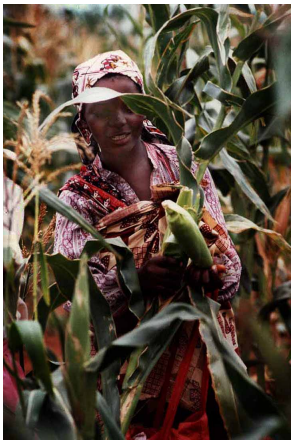

Figure 4. Maize has become a dietary staple in southern Africa.

America's vast contribution to Afro-Eurasia in terms of new plant species and cuisine, however, transformed life in places as far apart as Ireland, South Africa, and China. Before Columbus, the Americas had plenty of domesticated plants. By the time Columbus had arrived, dozens of plants were in regular use, the most important of which were maize (corn), potatoes, cassava, and various beans and squashes. Lesser crops included sweet potato, papaya, pineapple, tomato, avocado, guava, peanuts, chili peppers, and cacao, the raw form of cocoa. Within 20 years of Columbus' last voyage, maize had established itself in North Africa and perhaps in Spain. It spread to Egypt, where it became a staple in the Nile Delta, and from there to the Ottoman Empire, especially the Balkans. By 1800, maize was the major grain in large parts of what is now Romania and Serbia, and was also important in Hungary, Ukraine, Italy, and southern France. It was often used as animal feed, but people ate it too, usually in a porridge or bread. Maize appeared in China in the 16th century and eventually supplied about one-tenth of the grain supply there. In the 19th century it became an important crop in India. Maize probably played its greatest role, however, in southern Africa. There maize arrived in the 16th century in the context of the slave trade. Southern African environmental conditions, across what is now Angola, Zambia, Zimbabwe, Mozambique, and eastern South Africa, suited maize handsomely. Over the centuries, maize became the primary peasant food in much of southern Africa. In late 20th-century South Africa, for example, maize grew in two-thirds to three-quarters of the region's cropland.

Despite maize's success, the humble potato probably had a stronger impact in improving the food supply and in promoting population growth in Eurasia. The potato had little impact in Africa, where conditions did not suit it. But in northern Europe the potato thrived. It had the most significant effect on Ireland, where it promoted a rapid population increase until a potato blight ravaged the crop in 1845, bringing widespread famine to the area. After 1750, Scandinavia, the Low Countries, Germany, Poland, and Russia also gradually accepted the potato, which helped drive a general population explosion in Europe. This population explosion may have laid the foundation for world-shaking developments

such as the Industrial Revolution and modern European imperialism. The potato also fed mountain populations around the world, notably in China, where it encouraged settlement of mountainous regions.

Figure 5. Cassava root.

While maize and potatoes had the greatest world historical importance of the American crops, lesser crops made their marks as well. In West Africa, peanuts and cassava provided new foodstuffs. Cassava, a tropical shrub native to Brazil, has starchy roots that will grow in almost any soil. In the leached soils of West and Central Africa, cassava became an indispensable crop. Today some 200 million Africans rely on it as their main source of nutrition. Cacao and rubber, two other South American crops, became important export items in West Africa in the 20th century. The sweet potato, which was introduced into China in the 1560s, became China's third most important crop after rice and wheat. It proved a useful supplement to diets throughout the monsoon lands of Asia. Indeed, almost everywhere in the world, one or another American food crops caught on, complementing existing crops or, more rarely, replacing them. By the late 20th century, about one-third of the world's food supply came from plants first cultivated in the Americas. The modern rise of population surely would have been slower without them.

In contrast, the animals of the Americas have had very little impact on the rest of the world, unless one considers its earliest migrants. The camel and the horse actually originated in North America and migrated westward across the Bering land bridge to Asia, where they evolved into the forms familiar today. By the time of the Columbian Exchange, these animals were long extinct in the Americas, and the majority of America's domesticated animals would have little more than a tiny impact on Afro-Eurasia. One domesticated animal that did have an effect was the turkey. Wild animals of the Americas have done only a little better. Probably after the 19th century, North American muskrats and squirrels successfully colonized large areas of Europe. Deliberate introductions of American animals, such as raccoons fancied for their fur and imported to Germany in the 1920s, occasionally led to escapes and the establishment of feral animal communities. However, no species introduced from the Americas revolutionized human affairs or animal ecology anywhere in Afro-Eurasia. In terms of animal populations as with disease, the Americas contributed little that could flourish in the conditions of Europe, Africa, or Asia.

The Columbian Exchange in the modern world

Figure 6. At Lake Ontario in Canada, zebra mussels cling to the inside of a rusty pipe.

As the late dates of the introduction of muskrats and raccoons to Europe suggest, the Columbian Exchange continues into the present. Indeed, it will surely continue into the future as modern transportation continues the pattern begun by Columbus. Recently, for example, zebra mussels from the Black Sea, stowed away in the ballast water of ships, invaded North American waters. There they blocked the water intakes of factories, nuclear power plants, and municipal filtration plants throughout the Great Lakes region. Just as the arrival of Christopher Columbus's ships in America in the 15th century resulted in the worldwide exchange of disease, crops, and animals, the 20th-century practice of ships using water as ballast helped unite the formerly diverse flora and fauna of the world's harbors and estuaries. Similarly, air transport allows the spread of insects and diseases that would not easily survive longer, slower trips. Modern transport carries on in the tradition of Columbus by promoting a homogenization of the world's plants and animals. To date,

however, the world historical importance of modern exchanges pales beside that which took place in the original Columbian Exchange.

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The natives of America could trace the history of maize to the beginning of time. Maize was the food of the gods that had created the Earth. It played a central role in many native myths and legends. And it came to be one of their most important foods. Maize, in some form, made up roughly 65 percent of the native diet. When European settlers reached the New World, they learned to cultivate Indian corn from their native neighbors.

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About the author

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Paul Kane, Assiniboine Hunting Buffalo, ca. 1851-1856. National Gallery of Canada, Ottawa, Ontario. This image is believed to be in the public domain. Users are advised to make their own copyright assessment.

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Figure 5 (page 5)

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Figure 6 (page 5)

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