

Columbian exchange: plants, animals, and disease between the Old and New World

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Author: [National Humanities Center](#)

Author: [TeacherServe®](#)

Author: **[Alfred W. Crosby](#)**

Topic Editor: [Mark McGinley](#)



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Lead Author: [Alfred W. Crosby \(other articles\)](#)

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This article has been reviewed and approved by the following Topic Editor: [Mark McGinley \(other articles\)](#)

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For tens of millions of years the dominant pattern of biological [evolution](#) on this planet has been one of geographical divergence dictated by the simple fact of the separateness of the continents. Even where climates have been similar, as in the Amazon and Congo basins, organisms have tended to get more different rather than more alike because they had little or no contact with each other. The Amazon has jaguars, the Congo leopards.

However, very, very recently—that is to say, in the last few thousand years—there has been a countervailing force, us, or, if you want to be scientific about it, *Homo sapiens*. We are world-travelers, trekkers of deserts and crossers of oceans. We have gone to and lived or at least spent some time everywhere, taking with us, intentionally, our [crops](#) and [domesticated](#) animals and, unintentionally, our weeds, varmints, disease organisms, and such free-loaders as house sparrows. Humans have in the very last tick of time reversed the ancient trend of geographical biodiversification.

Many of the most spectacular and the most influential examples of this are in the category of the exchange of organisms between the Eastern and Western Hemispheres. It began when the first humans entered the New World a few millennia ago. These were the Amerindians (or, if you prefer, proto-Amerindians), and they brought with them a number of other Old World species and subspecies, for instance, themselves, an Old World species, and possibly the domesticated dog, and the tuberculosis bacillus. But these were few in number. The humans in question were hunter-gatherers who had domesticated very few organisms, and who in all

probability came to America from Siberia, where the climate kept the number of humans low and the variety of organisms associated with them to a minimum.



Hondius, 1607. (Source: [Yale University Library](#))

There were other avant garde humans in the Americas, certainly the Vikings about 1,000 CE, possibly Japanese fishermen, etc., but the tsunami of biological exchange did not begin until 1492. In that year the Europeans initiated contacts across the Atlantic (and, soon after, across the Pacific) which have never ceased. Their motives were economic, nationalistic, and religious, not biological. Their intentions were to make money, expand empires, and convert heathen, not to spread Old World DNA; but if we take the long view we will see that the most important aspect of their imperialistic advances has been the latter.

They off-handedly and often unintentionally effected enormous augmentations and deletions in the biota of the continents, so enormous it is difficult to imagine what these biotas were like prior to Columbus, et al. A large tome would not provide enough space to list the plant, animal, and micro-organism exchanges, and a thousand volumes would be insufficient to assess their effect. In the space of this essay, we can only manage to convey an impression of the magnitude of these biological revolutions.



Horse, in Ruini, "Dell'anatomia et dell'infermità del cavallo", 1598. (Source: Library of Congress)

Let us begin with a thumbnail sketch of the biogeography of the globe when Columbus set sail. Everyone in the Americas was a Amerindian. Everyone in Eurasia and Africa was a person who shared no common ancestor with Amerindians for at the very least 10,000 years. (I omit the subpolar peoples, such as the Inuit, from this analysis because they never stopped passing back and forth across the Bering Strait). The plants and animals of the tropical continents of Africa and South America differed sharply from each other and from those in any other parts of the world. I recommend that you consider the contrast between the flexibly nosed tapir of South America and the more extravagantly nosed elephant of Africa. The plants and animals of the more northerly continents, Eurasia and North America, differed not so sharply, but clearly differed. European bison and American buffalo (which should also be called bison) were very much alike, but Europe had nothing like the rattlesnake nor North America anything like the humped camel.

The contrast between the two sets of organisms, Old World and New World, those closely associated with humanity—[crop plants](#), [domesticated](#) animals, germs, and weeds—was very

sharp. The difference between the two lists of crops was, with the possible exception of cotton, absolute. (I am omitting dozens of not quite so important crops in these lists.)

The difference between the two lists of domesticated animals is even more amazing. They differ not only in content but in length.

The achievements of Amerindian farmers were as impressive as those of Old World farmers, especially if you take into account the fact that the Amerindians' lands were smaller in area and they had fewer species of plants to work with than the Old World farmers, but the achievements of Amerindian livestockmen were clearly inferior to their Old World opposite numbers. Perhaps the Americas simply had fewer species of large mammals that could be tamed. There were, for instance, no wild horses or cattle in the Americas to tame. What about North American buffalo? They resisted and still resist domestication. The Amerindians did domesticate the llama, the humpless camel of the Andes, but it cannot carry more than about two hundred pounds at most, cannot be ridden, and is anything but an amiable beast of burden.

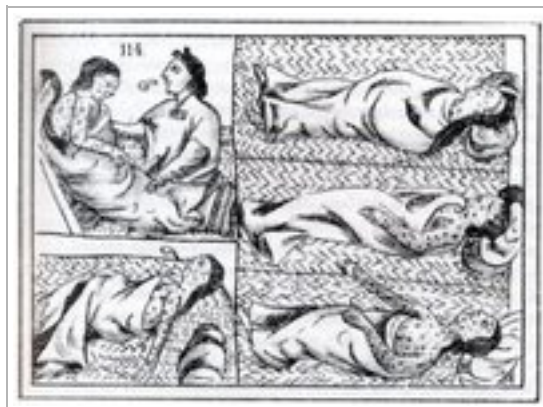


Illustration from Sahagún, "Historia general de las cosas de Nueva España", c. 1575-1580;

ed., tr., James Lockhart, "We People Here: Nahuatl Accounts of the Conquest Mexico" (Univ. of California Press, 1993)

More astonishing than the difference between the length of the lists of Old World's and New World's [domesticated](#) animals is the difference between the lengths of the lists of infectious diseases native to the two. The New World had only a few, possibly because humans had been present there and had lived in dense populations, cities, for a short time compared to the Old. Possibly of greater importance is the relative lack of domesticated herd animals in America, one of our richest sources of disease micro-organisms. (For instance, we share influenza with pigs and other barnyard animals).

There were infections in the New World before 1492 that were not present in the Old (Chagas' disease, for instance). There were those it shared with the Old World, certainly one or more of the treponematoses (a category including syphilis) and possibly tuberculosis; but the list is short, very short. When we list the infections brought to the New World from the Old, however, we find most of humanity's worst afflictions, among them smallpox, [malaria](#), yellow fever, measles, [cholera](#), typhoid, and bubonic plague.

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