

THE GREAT EXCHANGE

©Dr. John Freedman 2024

'The Great Exchange' began when Christopher Columbus arrived in the Caribbean on October 12, 1492. The ensuing global transfer of botanicals, livestock, genes, and microbes completely reshaped the world. The exchange went both ways, as the Old World biome changed the New World and the New World biome changed the Old - often in profound and unforeseen ways. Some of the origins in the chart below may surprise you. The fuller stories compose the intriguing biogeographic and historical threads of our 'Great Exchange' lecture series and the intellectual forays it inspires.

| CROP | ORIGIN | COMMENTS |
|---------------|-----------------------|--|
| Tomatoes | Peru/Bolivia | Imagine Italian food before the 16 th century. |
| Potatoes | Peru/Bolivia | With its high energy density and vitamin C content, the potato freed the populace from subsistence farming, thus allowing urban migration, enabling the Industrial Revolution, and ultimately enabling northern European countries to take over much of the world. |
| Peanuts | Peru/Bolivia | Transplanted to Africa where they became a favorite food, the peanut returned to its New World homeland in the small gardens tended by slaves in the American South. |
| Chocolate | Amazon to Mesoamerica | It all began with The Mayan ceremonial drink of gods and nobles. Bitter and thin, but the Mayans valued cacao beans enough to use them as currency. Columbus disliked it. Conquistador Cortez saw more potential and sent some beans to Spain. He was right. |
| Vanilla | Mexico | The shriveled seed pod of the vanilla orchid was called <i>tlilxochitl</i> - 'black flower' - by the Aztecs. The Spanish gave it the name vanilla, which means 'little vagina' (= little sheath, in Latin). Madagascar & Indonesia produce 2/3 of the world's natural vanilla today. |
| Coffee | Ethiopia | The odyssey of the coffee bean from Ethiopia to Yemen (Mocha was a key port) to Europe and the world is a colorful & never-ending tale. |
| Black Pepper | India | The first ever sea voyage from Europe to Asia by Vasco da Gama in 1498 was a pepper run to India's Malabar Coast - with 6000% profit. |
| Chili Peppers | Peru/Bolivia | All peppers, from the mildest green 'bell' peppers to nuclear hot chili peppers, are originally of New World origin |
| Pineapple | Paraguay/Brazil | Despite immense production in Asia and Hawaii and elsewhere, the pineapple originated in the New World. It was coveted in Europe and became a symbol of high-end hospitality. |
| Blueberries | Canada | Blueberries that we know today are all of New World origin. Some related species are indigenous to Europe and the Madeira islands. |
| Strawberries | New World | Wild strawberries (not true berries by the way) are found worldwide in temperate climates, but the 'garden strawberries' we eat today came from New World - a hybrid of Virginia and Chilean cultivars - developed in France! |
| Squash | Mesoamerica | Edible squash are of New World origin, with genetic studies pointing to Mexico. Though the name SQUASH derives from the native Narragansett language. Squash is the 'pioneer crop' of the Americas- cultivated 8000 years ago- 4000 years before maize! |
| Beans | Old & New World | Beans existed in Eurasia before Columbus, but navy beans, pinto beans, kidney beans, and lima beans (from Guatemala, not Peru) are all New World crops |
| Passionfruit | South America | Beloved in Asia & worldwide. Brazil & Ecuador lead production today The 'passion' name has religious, not aphrodisiac, origins. |

| | | |
|----------------|-----------------|---|
| Sugar Cane | New Guinea | From its earliest cultivation in New Guinea it spread to India, China and the Middle East. The Crusaders brought back 'the honey reed' to Europe. 'White gold' grown in the New World fueled one of the very darkest chapters in human history: the Atlantic Slave Trade. The sweetness belies the danger of this moral and biological toxin. |
| Corn | Mexico | Number one crop worldwide today, for better or worse. |
| Rice | China | Wet rice agriculture was the jet fuel propelling Asian civilization. |
| Wheat | Middle East | The 'amber waves of grain' define the American heartland, but they are not native. |
| Carrots | Afghanistan | Who knew? |
| Sweet potatoes | Central America | Yet a staple in Papua New Guinea and the South Pacific |
| Yams | Africa | Biologically distinct from sweet potatoes, though the terms are often incorrectly used interchangeably |
| Eggplant | Southern China | Marco Polo wrote about them and the Italians (especially in Parma) listened. |

| | | |
|-------------|-------------------------|--|
| Tobacco | South & Central America | Not one of the native Americans' best legacies. |
| Bananas | India or Southeast Asia | Not native to the Americas but thrives in hot and humid Central America and the Caribbean (where Jamaica pioneered its planting.) |
| Wine Grapes | Caucasus | <i>Vitis vinifera</i> wine grapes are Old World. The New World had its own grapes, but the Classic American 'Thompson Seedless' is originally from the Aegean! #1 grape producer today? Italy, followed by France & the USA. NOTE: The Phylloxera louse that destroyed the European wine grape crop in the late 1800s was native to America! So resistant American rootstock grafts onto European plants solved the problem. |
| Oranges | China | The Great Exchange was good for Florida. The orange was literally invented in China by crossing a mandarin with a grapefruit. |
| Lemons | Burma | A cross between a bitter orange and a citron. Spread widely through the Middle East (the word lemon comes from Persian) and to the Greeks & Romans |
| Apples | Central Asia | As American as (Kazakhstani) apple pie? |
| Avocados | Mexico | Famously brought to USA by 'Food Explorer' David Fairchild. In an exception to 'the Migration Favors the Plants' rule, Mexico still leads the world in production (and consumption) by far. |
| Papaya | Mesoamerica | Another Mexican gift, beloved in Asia and worldwide today. India leads production today by far, followed by Brazil & Mexico. |
| Honey | Europe | There were no honeybees in the New World until 1550. The very first honeybees from Europe were brought to Bermuda in 1620, and then to North America soon thereafter. |
| Onions | Iran or Central Asia | Onions are among the most ancient human foodstuffs and were part of the human diet long before agriculture. Origins are debated – pre-Colombian Americans may have had some types of wild onions |
| Peaches | Iran | What we call a Georgia peach was once known as a 'Persian apple'. |
| Kale | Eastern Med | Another crop introduced to America by 'Food Explorer' David Fairchild |
| Cucumbers | India | Raita is an ancient dish made with native ingredients. |
| Indigo dye | India | Many literally died for this valued purple dye. |
| Cannabis | Central Asia | The psychoactive plant was used by humans as long as 12,000 yrs ago. It only arrived in the US (from Mexico) in the early 1900s. |

| | | |
|---------------|-------------------------------|--|
| Rubber | Brazilian Amazon | After the seeds were stolen by adventurer Henry Wickham in 1876, British Malaya became the world's #1 producer. Today 70% of the world's rubber is synthetic. #1 producer of natural rubber today: Thailand (followed by Indonesia, Malaysia, and Vietnam). |
| Curare | Central & South America | Life-saving muscle relaxant medications used in anesthesia and critical care today are direct descendants of this 'poison arrow' toxin |
| Quinine | North Andean lowlands | This life-saving bark extract of the 'fever tree' drug changed the world, including but not limited to enabling European conquests in India, Southeast Asia, and Africa. |
| Cotton | Mexico | Ancestral strains come from Mexico by genomic analysis, but cotton had spread widely before the continents split and has been cultivated throughout the world for millennia. |
| Coconut | Insular SEAsia & South India | 2 foci of genetic diversity, unclear which came first. What is clear is that all the coconut palms in the Caribbean, South America, Africa and elsewhere were brought by seafarers. |
| Pomegranate | Iran ?Pakistan, India | Introduced into America in the late 1500s and planted in California by Spanish settlers in 1769. A symbol of prosperity and good luck in many cultures, as well as a major culinary ingredient, and more recently touted as a health food due to its anti-oxidant content. |
| Kola nut | West Africa | Brought to the New World on slave ships. Used (along with cocaine) to make the very first version of Coca-Cola in 1885. |
| Bougainvillea | Brazil | Discovered by the cross-dressing French naturalist Jeanne Baret – who was also the first woman to circumnavigate the world |
| Frangipani | Central America | Named for an Italian perfume-maker and prized in Asia, this flower is native to the New World |
| Sunflower | North America | The seeds were a staple crop of several native American groups |
| SPICES | | |
| Nutmeg | Indonesia (Banda Islands) | Nutmeg saved New York in 1667 when the Dutch only agreed to relinquish it to the British in return for the nutmeg island of Pulau Run in the southern Moluccas. True story. |
| Mace | same as nutmeg | Made from the dried tendrils around the nutmeg seed. |
| Clove | Indonesia (northern Moluccas) | This was the target of Magellan's world-changing voyage 1519-21. He didn't survive it, but cloves brought back from Ambon in the Moluccas covered all expenses of the armada. |
| Cardamom | India | These wonderfully aromatic seeds are today the 3 rd most expensive spice by weight, after saffron and vanilla. |
| Cinnamon | Sri Lanka (old 'Ceylon') | Trees with cinnamon-like bark grew in the Amazon and many an explorer died trying to find 'La Canela'. But the real thing originated in Sri Lanka, which still grows the best cinnamon. |
| Saffron | Iran | Made from the stigma and styles of the crocus flower, these 'threads' still command the highest price of any spice. Vanilla is second. |
| Cumin | Middle East | These aromatic seeds of a plant in the parsley family were beloved by the ancient Greeks. India is the 2 nd largest producer today (after China) but by far the largest consumer. |
| Anise | Egypt | While similar in flavor to fennel and licorice, anise is a distinct plant. The seeds of the plant have a sweet aromatic flavor and are typically used to make sweets or, in Greece, to flavor ouzo. Herbalists say it helps flatulence; evidence is lacking. |
| Basil | India | In the mint family, this is a key ingredient in Margherita pizza- a special red (tomato), white (cheese) and green (basil) pizza sporting the colors of the Italian flag - baked for Queen Margherita in 1889. |

| | | |
|----------|-----------------------------|--|
| Allspice | Caribbean & Central America | Columbus brought it from Jamaica to the Spanish Court. Jamaica still leads the world in production. Chili pepper, and allspice are the only true New World spices (unless we consider vanilla a 'spice'). |
|----------|-----------------------------|--|

'NUTS'

(We non-botanists use the term NUT loosely. Our concept of nuts includes both true botanical nuts – noted in **bold** in the chart - and 'culinary nuts', such as almonds and pecans and pistachios which are oily nut-like delectable seeds but not actually true botanical nuts - though we think of them and eat them as 'nuts'.)

| | | |
|-----------------|---------------------------|--|
| Peanuts | South America | A legume, not a nut. But truly American. |
| Almonds | Iran | Persian origin but now America's favorite 'nut'. But not a true nut (botanically). |
| Pistachios | Iran | Likewise from ancient Persia. And likewise not a true nut. The fleshy fruit (mesocarp) around the hard seed of pistachio, almond & other 'culinary nuts' is what makes them (technically) drupes and not nuts. |
| Walnuts | Iran & North America | The ancestral progenitor is unclear and both the Old and the New Worlds have their indigenous walnuts. But they too are not true nuts. |
| Pecans | North America | Truly American, indigenous to the southern USA - but not a true botanical nut. The USA leads the world in production with Georgia, Texas, and New Mexico leading in production. |
| Macadamias | Australia | Named after Scottish-born Australian scientist and politician John Macadam. Biggest producer today? South Africa most recently surpassed Australia which had recently surpassed Hawaii. |
| Coconut | Indo-Pacific | There were no coconuts in the Caribbean when Columbus arrived, despite artful depictions. Though Marco Polo called it Indian Nut when he encountered it in Sumatra, this one too is a drupe. |
| Brazil nuts | Amazonas | A true New World 'nut', but also not a botanical nut. |
| Cashews | Amazonas | Likewise. The fleshy white fruit is made into a delicious juice in Brazil, <i>suco de caju</i> . |
| Chestnut | North America and Eurasia | A true botanical nut! This ancient species was widespread before the continents separated. Origin of the original ancestral population remains uncertain. |
| Hazelnut | Turkey, Iran | Another true botanical nut. Aka filbert. Turkey leads the world in production- but over 25% of the world's hazelnuts are used by Italian chocolatier Ferrero to make their Nutella spread. |

FAUNA:

| | ORIGIN | COMMENTS |
|------------|---------------|--|
| Turkeys | North America | Mis-named because they were thought to resemble a Turkish Guinea fowl. Actually no relation. |
| Horses | Eurasia | Horses were long extinct in the New World when Europeans arrived. The Incas had never seen a horse, and the fearsome appearance of mounted Spanish soldiers played a role in the Incas' defeat by Pizarro in 1532. |
| Pigs | Eurasia | All descended from the wild boar. Domesticated as early as 13000 BC. |
| Cattle | Turkey | All cattle are descended from the giant auroch which stood 6 feet high. Anatolian Turks were the first to domesticate them about 10,000 years ago. |
| Sheep | Middle East | But they now outnumber humans in New Zealand (and Wales, and Scotland). |
| Goats | Middle East | Wild goats likely evolved in Asia. First domestication in Iran, Iraq, Turkey. |
| Earthworms | Eurasia | Brought to North America in root balls of plants and ship's ballast. The consequences of which are still unfolding. |

MICROBES:

| PATHOGEN | ORIGIN | COMMENTS |
|------------------------|------------------|---|
| Measles virus | Eurasia | A downside of the Agrarian Revolution and the development of civilization, as these viruses are of bovine origin. Europeans developed partial resistance over thousands of years. Not so for the New World peoples who had no livestock and no experience with these viruses. Old World viruses killed more native Americans than all other genocidal forces, by far. The relative resistance of Africans to European viruses was a key factor promoting their enslavement. It's as dark a story as there is. |
| Influenza virus | Eurasia | Ditto above. And sadly, infants and children are again dying of diphtheria and measles due to anti-vaccination misinformation. |
| Diphtheria virus | Eurasia | Ditto above. |
| Tuberculosis bacterium | Eurasia | Also a livestock-born disease. |
| Shigella bacterium | Tropical America | Columbus may have contracted Shigellosis dysentery and suffered from auto-immune sequelae known as Reiter's Syndrome – which led to lifelong crippling arthritis – and may have killed him at the young age of 54. |
| Smallpox virus | Eurasia | Ditto above but the smallpox virus itself, likely a mutant of the cowpox virus of cows (which was used to make the first smallpox vaccines) only infects humans. |
| Yellow fever virus | Africa | Both the <i>Aedes aegyptii</i> mosquito vector and the yellow fever virus were imported from old World to New via the slave trade. The disease ravaged the New World for centuries before Cuban doctor Carlos Finlay and American Walter Reed confirmed its transmission mode and initiated mosquito eradication programs that dramatically reduced spread (and allowed the Panama Canal to be built) |
| Malaria parasite | Africa | While the New World had its own Anopheles mosquitoes, the Plasmodium parasite only arrive in the 1500s with African slaves (who were largely immune). Not so the native Americans, who succumbed easily to the disease- though their 'fever tree' (cinchona) bark was found to have strong anti-malarial properties due to its quinine content. See Quinine above. |
| Syphilis bacterium | ? New World | This remains controversial. Conventional wisdom blames Columbus or his men for bringing it from New World to Old. But recent data indicate syphilis may well have been present in Central Europe as early as 1320 AD. Some medical historians date it back even further, to Ancient Greece or earlier. The first clearly recorded cases of classic syphilis occurred in Italy in 1495. Further chronobiologic research will shed more light on this controversy. |