THE GREAT EXCHANGE

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'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 16th 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 *tlilxochitl* - '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	*Vitis vinifera* wine grapes are Old World. The New World had its own grapes, but the Classic American 'Thompson Seedless' is originally from the Aegean! #1grape 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 thee 3rd 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 2nd 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 & CentralAmerica	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 i**n 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 nut (botanically).
Pistachios	Iran	Likewise from ancient Persia. And likewise not a nut. The fleshy fruit (mesocarp) around the hard seed of the pistachio, almond and 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	A true American nut, indigenous to the southern USA. But not a true nut. The USA leads the world in production. Georgia,Texas, and New Mexico vie for the crown of #1 US producer from year to year.
Macadamias	Australia	Who knew? 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 is 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, *suco de caju.*
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 consquences 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 *Aedes egyptii* 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.