



## 2022 CER Lunchtime Lectures - Humboldt, Science, and The Geography of Nature

### Western Culture and the Study of Nature

January – Natural Philosophy and the Study of Nature

February – Natural History and the Taxonomy of Nature

March – Ecological Imperialism and the Geography of Nature

April – Physical Geography and the Science of Nature

### Humboldt and the Science of Nature

May – The Science of Nature: Humboldt and the Empirical Earth

June – The Romance of Nature: Science, Imagination, and the Poets of Nature

July – The Invention of Modern Nature: The Earth as a “Natural Whole”

August – The Evolution of Nature: Humboldt, Darwin, and Biogeography

September – The Economy of Nature: Ecology, Culture, and Cosmos

### Humboldt and the Geography of Nature

October – The Great Disruptors: Physical Geography as Modified by Human Action

November – The Earth Managers: New Science and Environmental Change

December – The Anthropocene: Gaia and the Geography of Nature





## Ecological Imperialism and the Geography of Nature

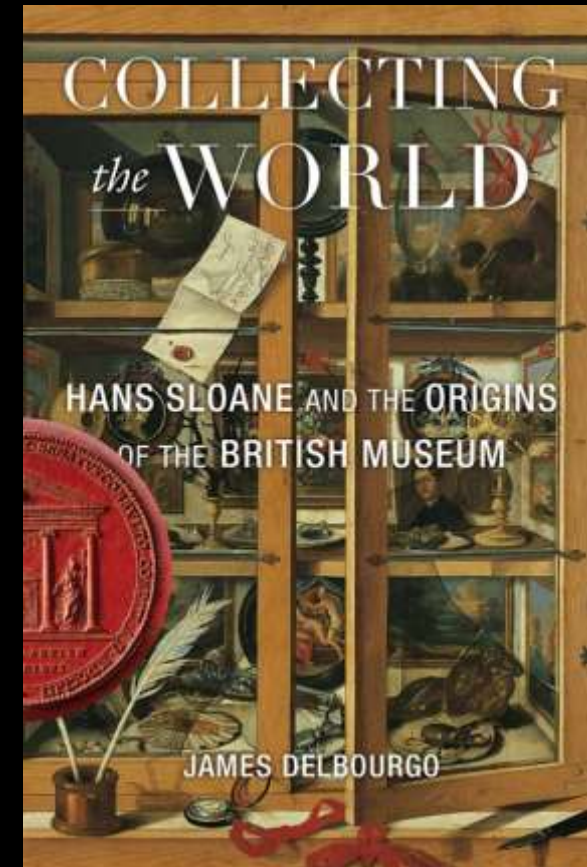
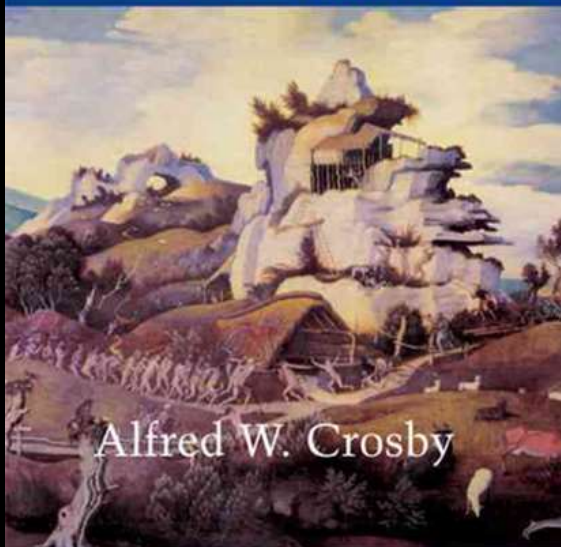
Kevin M. Anderson, Ph.D.

Austin Water Center for Environmental Research

### ECOLOGICAL IMPERIALISM

The Biological Expansion  
of Europe, 900–1900

NEW EDITION



# Natural Philosophy → Natural History

## Aristotle → Scientific Revolution

- Observation and Description
- Bestiaries, Herbals
- Encyclopedias of New Nature
- Realism - Artists as Naturalists
- Scientific Revolution/Taxonomy
- Explaining Order and Change



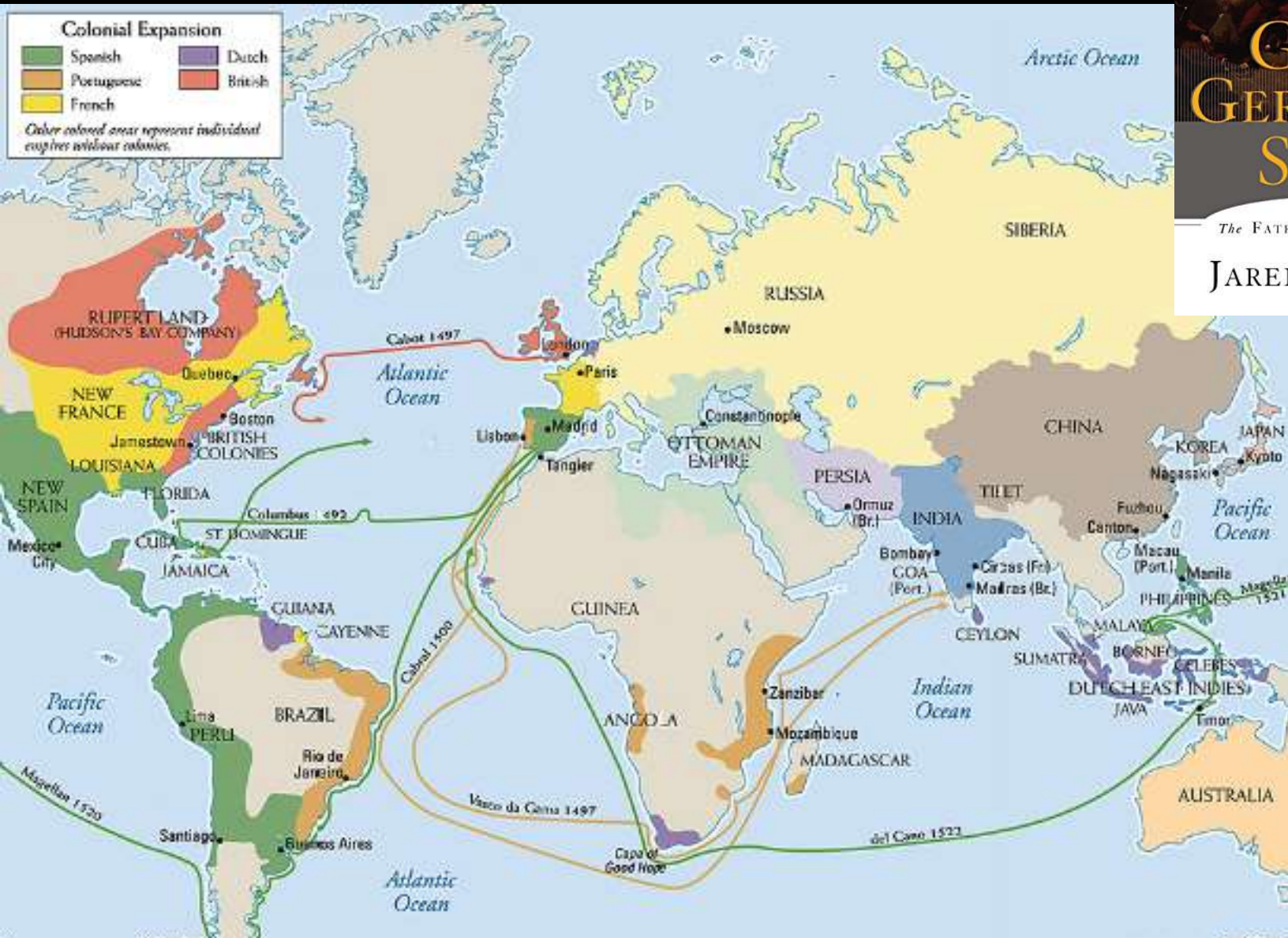
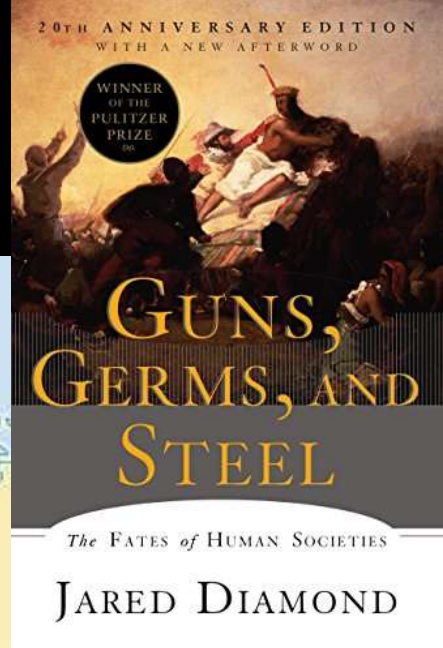


# The Age of Exploration and Discovery 1400s-1700s

Collecting - Artists as Naturalists

Scientific Travelers

# European Imperial Conquest

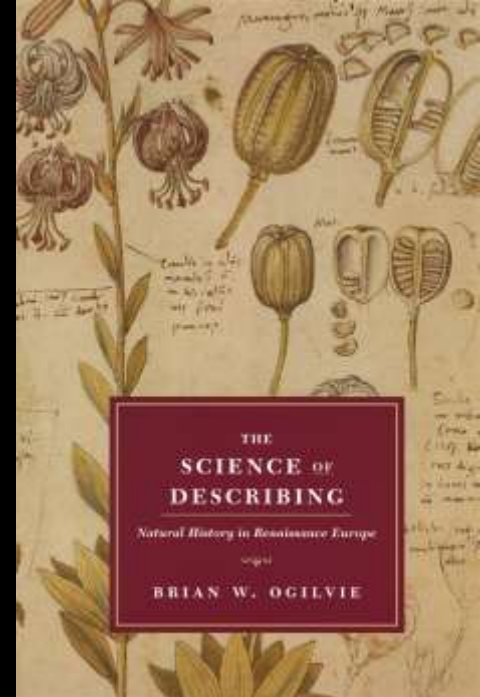


## The Collecting Impulse and Putting in Order

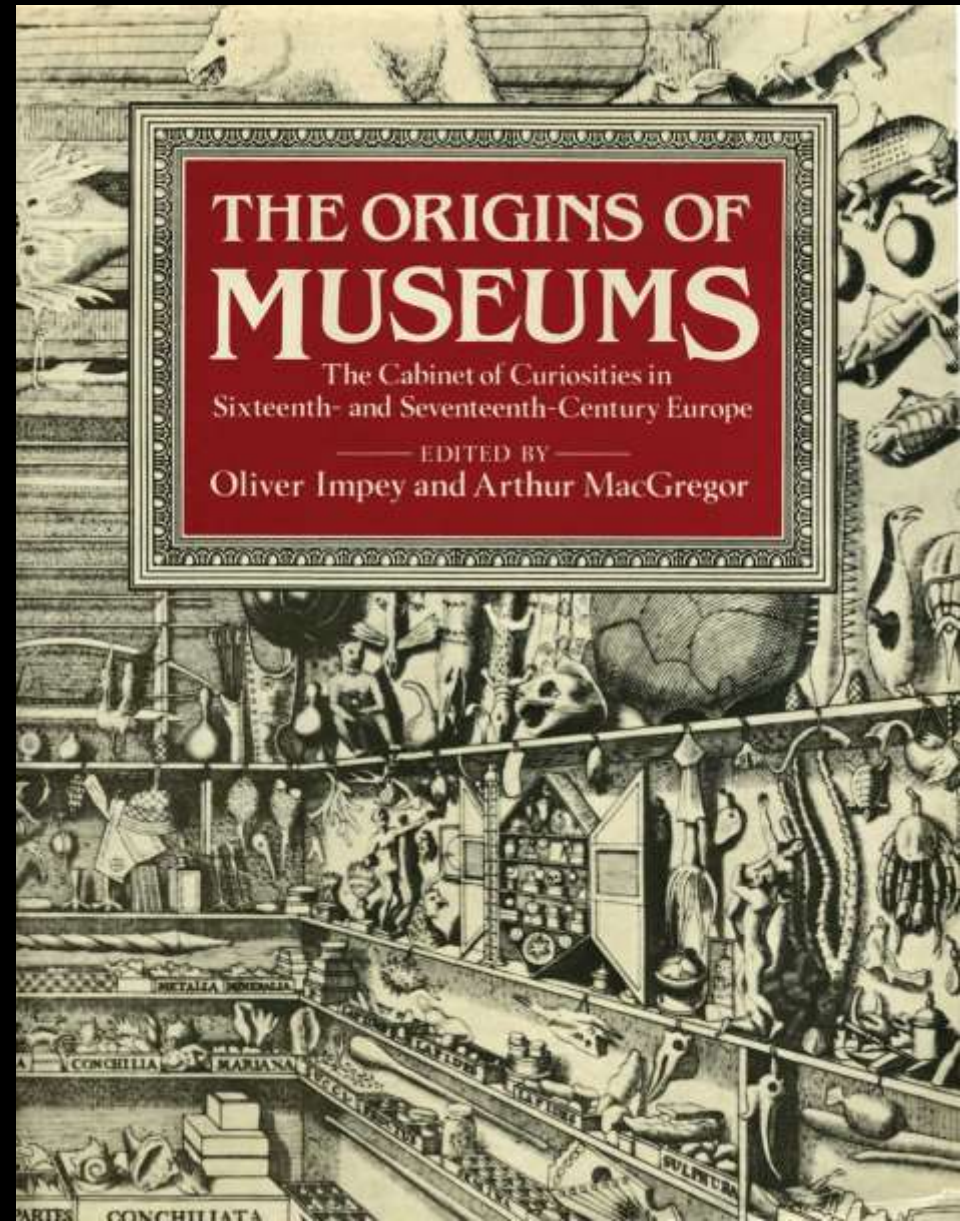
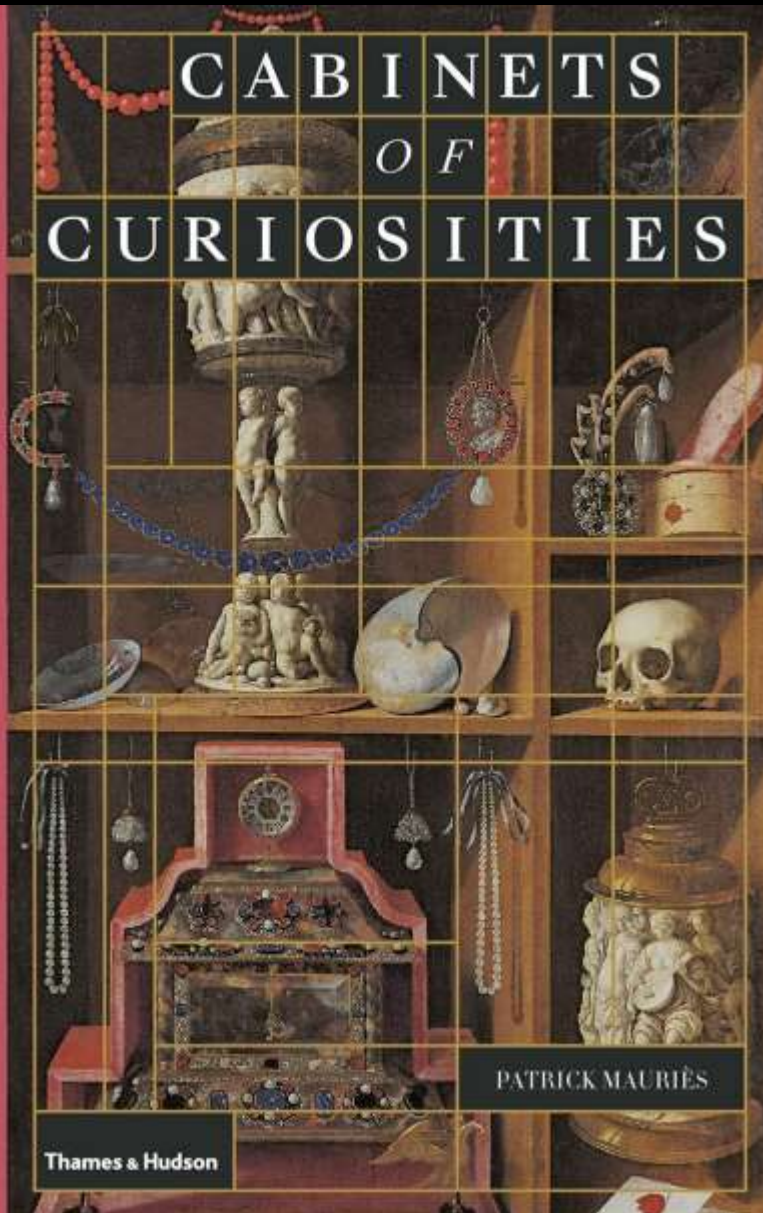
“The collecting impulse, the desire to possess as many and as varied things as possible...in particular to its pursuit in gardens, herbaria, and cabinets...drove natural history along a path toward less immediate experience of nature *in situ*...

... (to) the more formal delight at perceiving, and putting in order, the similarities and differences between hundreds and thousands of individual species.

The search for a formally elaborate system in nature, one that would go beyond tacit perceptions of relationships, has its origins in this pursuit.”

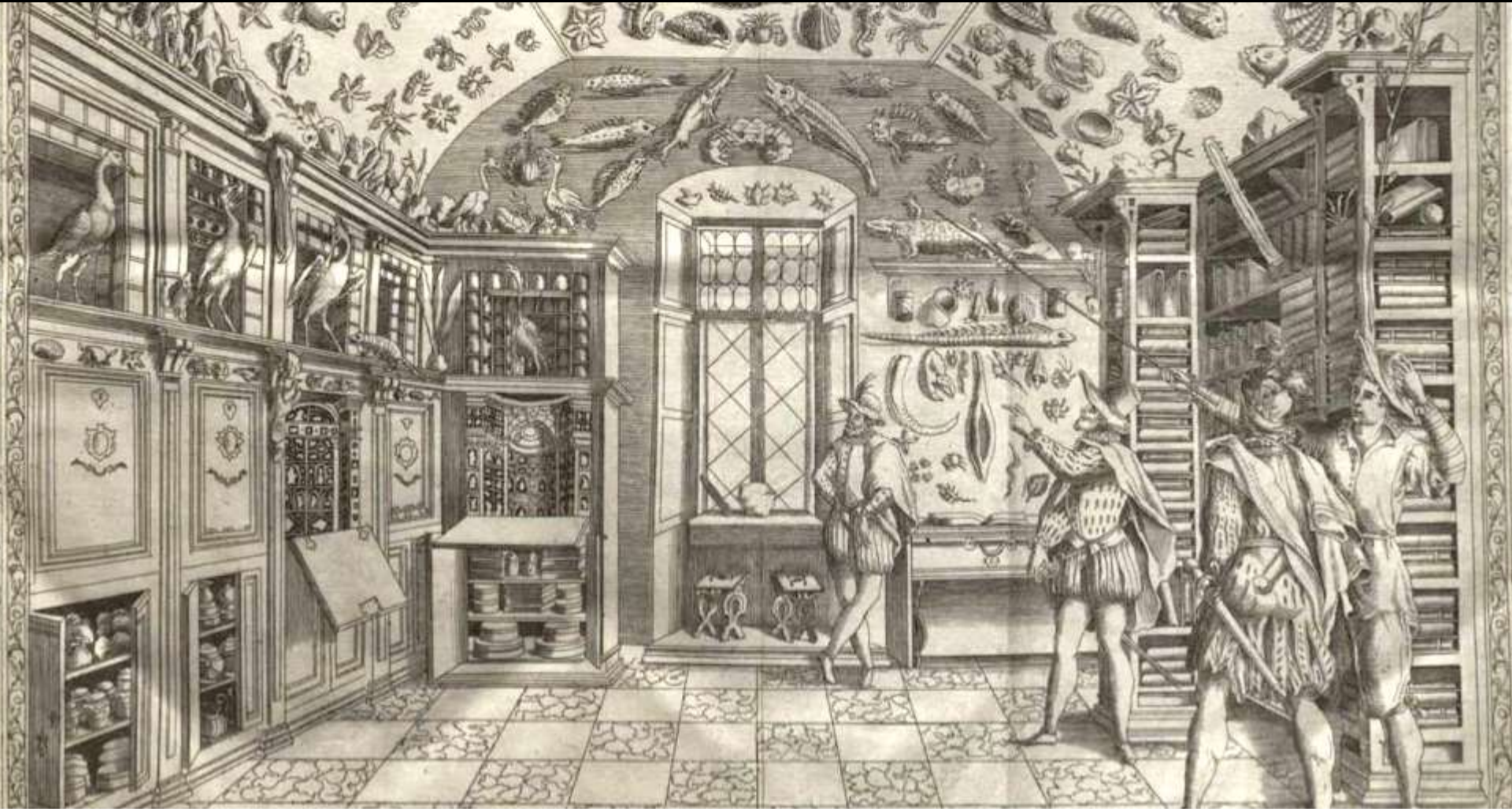


The Collecting Impulse  
Curiosity and Wonder  
1500s – 1700s



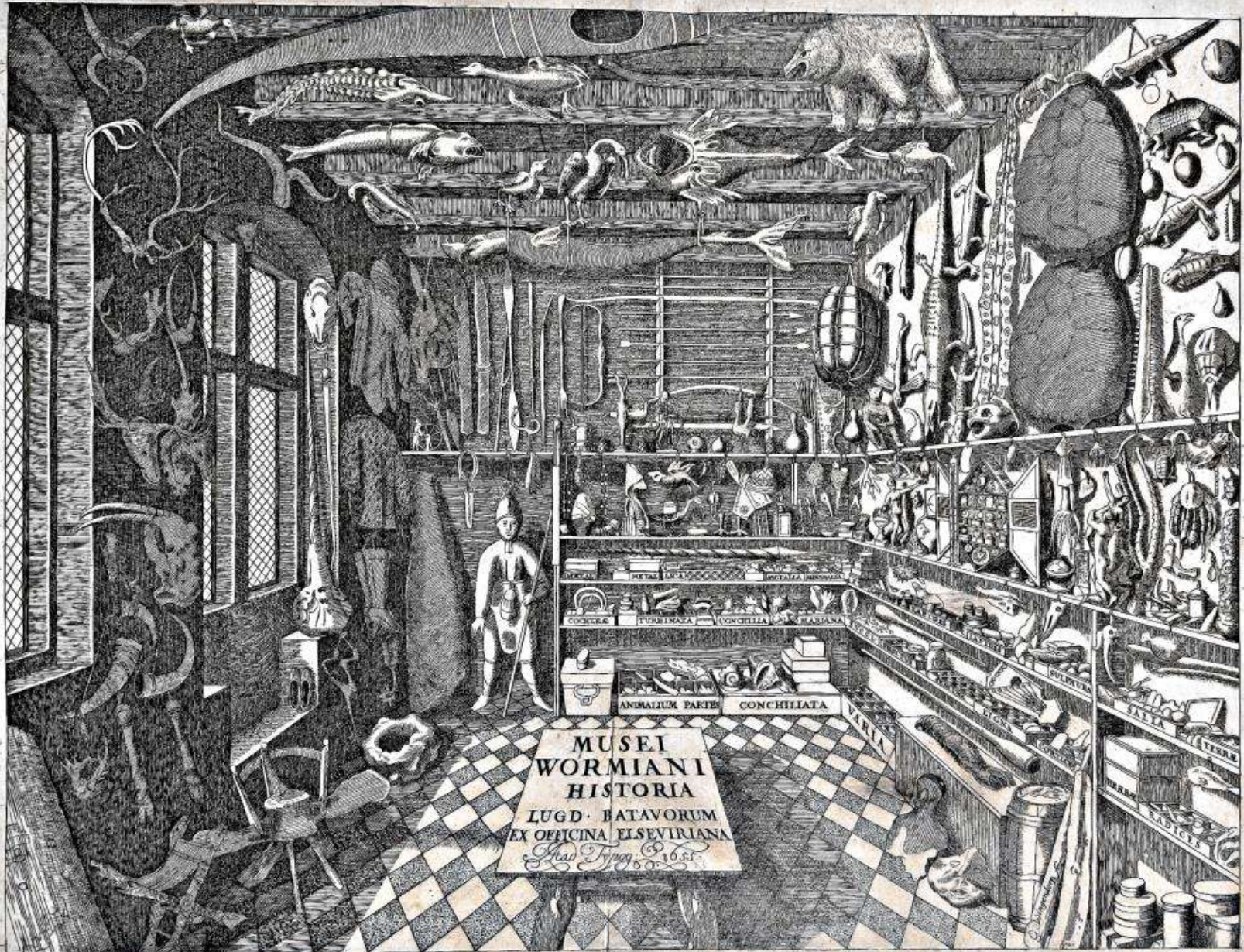
## Wonder Rooms (Cabinets) or Art Rooms (Kunstkammer or Wunderkammer)

The earliest pictorial record of a natural history room is the engraving in Ferrante Imperato's book *Dell'Historia Naturale* (Naples 1599)





"Musei Wormiani Historia", the frontispiece from the *Museum Wormianum* depicting Ole Worm's cabinet of curiosities. Olaus Wormius (1588–1654)



A corner of a wunderkammer, painted by Frans II Francken in 1636



## Cabinets of Curiosities – Art Boxes

### “Kunstschränke”

These were cabinets in the sense of pieces of furniture, made from all imaginable exotic and expensive materials and filled with contents and ornamental details intended to reflect the entire cosmos on a miniature scale.

The best preserved example is the one given by the city of Augsburg to King Gustavus Adolphus of Sweden in 1632, now in the Museum Gustavianum in Uppsala.



# Scientific Travelers and The Collecting Market

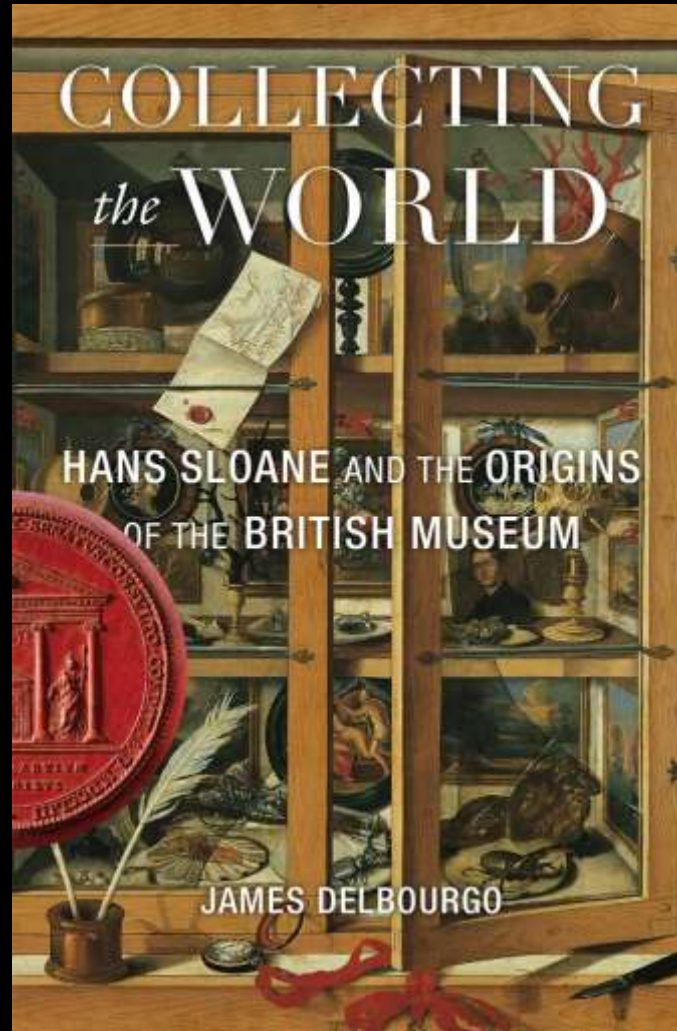
The market for natural artifacts and natural history books from the New World grows in the 1600s

MARIA SIBYLLA  
**MERIAN**

Metamorphosis insectorum Surinamensium  
Verandering der Surinaamsche Insecten  
Metamorphosis of the Insects of Suriname | 1705



LANNOO KB

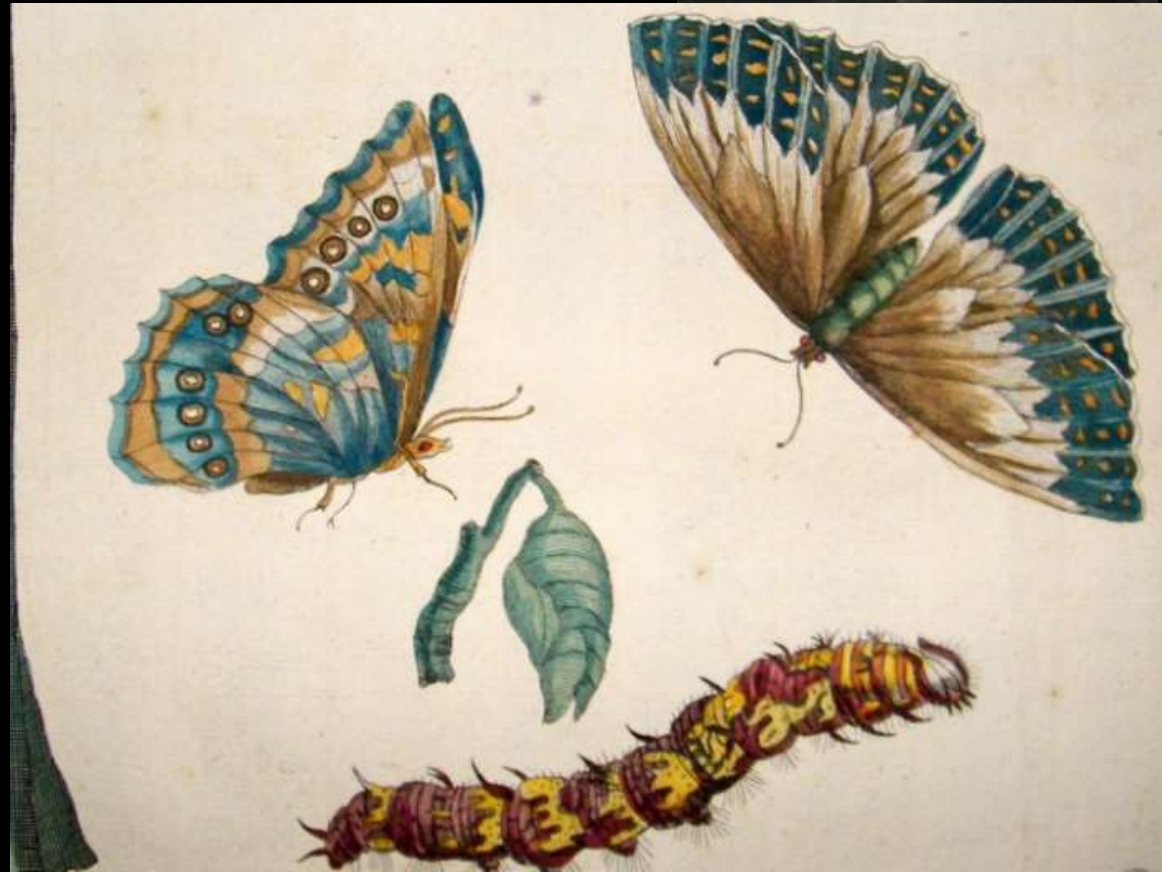


# Artist Naturalist and Nature Entrepreneur

## Maria Sibylla Merian 1647-1717

*The Caterpillars' Marvelous Transformation and Strange Floral Food* 1679 - Life cycle and Metamorphosis - Depicted larvae hatching from eggs when the idea of spontaneous generation of insects was still accepted

Merian described the life cycles of 186 insect species



# Travel and Trade – Suriname 1699-1701

In 1699, at 52 and accompanied only by her daughter, Merian set off on the first scientific expedition to the Dutch colony of Suriname and collected and traded insects, crocodiles, and turtles

Self publishes *Metamorphosis Insectorum Surinamensium* 1705



MARIA SIBYLLA  
MERIAN

Metamorphosis insectorum Surinamensium  
Veränderung der Surinamische Insecten  
Metamorphosis of the Insects of Suriname 1705



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# Science and Art

Goethe praised Merian for her ability to move  
“between art and science, between nature observation and artistic intention.”



# The Scientific Traveler and The Personal Narrative

## William Dampier 1651–1715

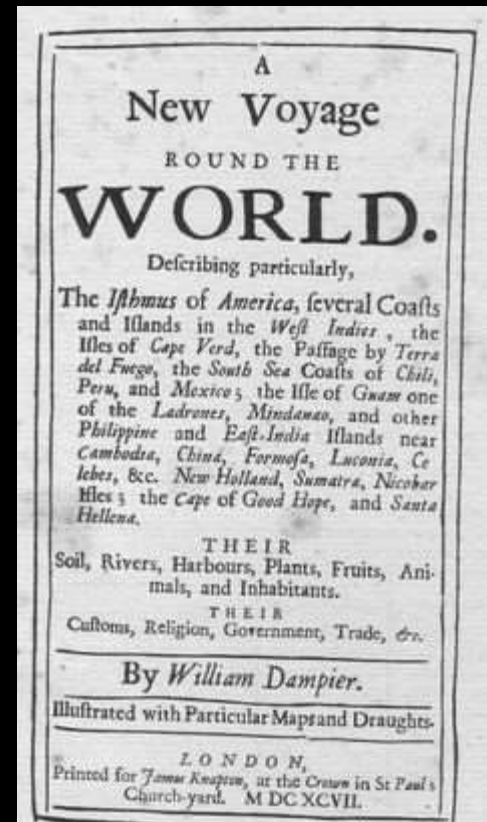
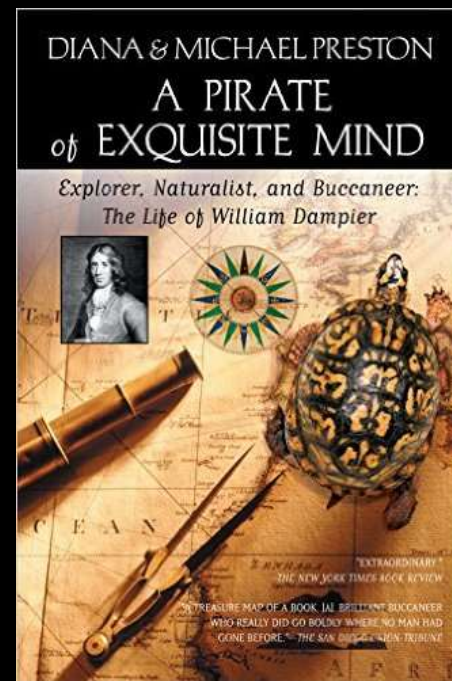
- The first person to circumnavigate the world three times
- First Voyage (1679–1691)
- The first English best-selling travel writer *A New Voyage Round the World* 1697
- Second Voyage (1699–1701) the first official voyage of discovery ordered by the British Admiralty, captain on board the H.M.S. Roebuck.
- Third Voyage (1703–1707) The first Englishman to reach and map parts of Australia and New Guinea



Coleridge “a man of exquisite mind”

Words Dampier introduced to English:

- avocado
- barbecue
- breadfruit
- cashew
- catamaran
- chopsticks



Title-page of the first edition of "A New Voyage Round the World"

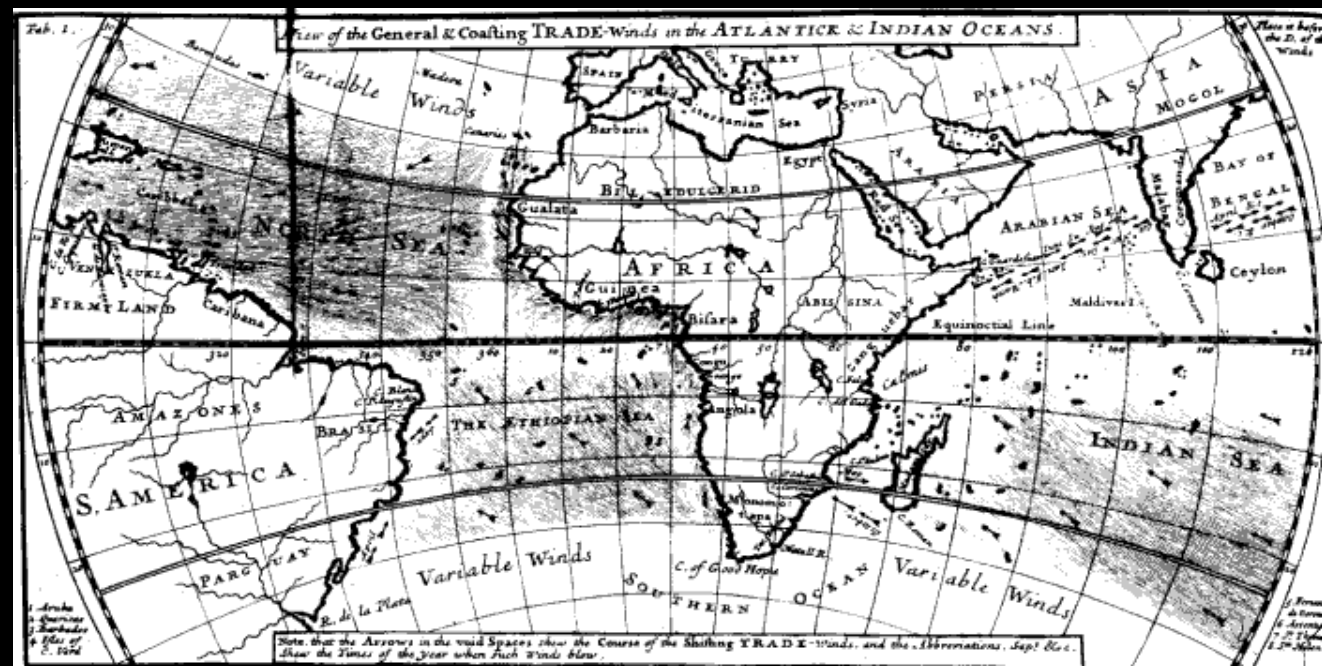
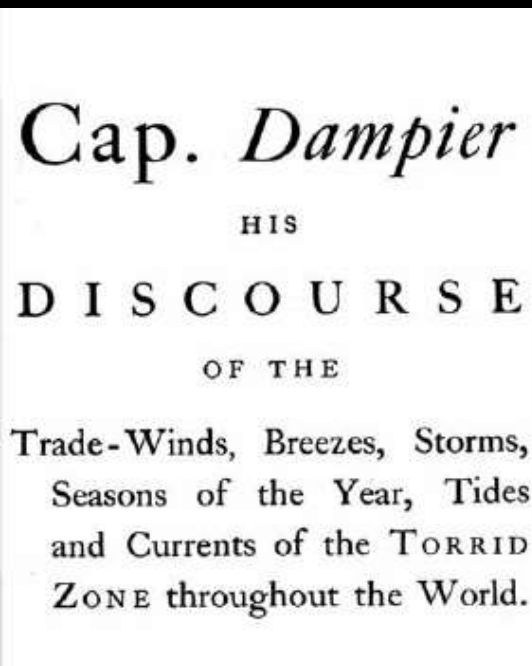


# Global System – Winds and Currents

In 1699, Dampier followed his *New Voyage with Voyages and Descriptions*, which contained a significant technical work, “A Discourse of Trade-Winds, Breezes, Storms, Tides, and Currents.”

The first scientific traveler to connect winds and surface currents and produce the first wind map of the world

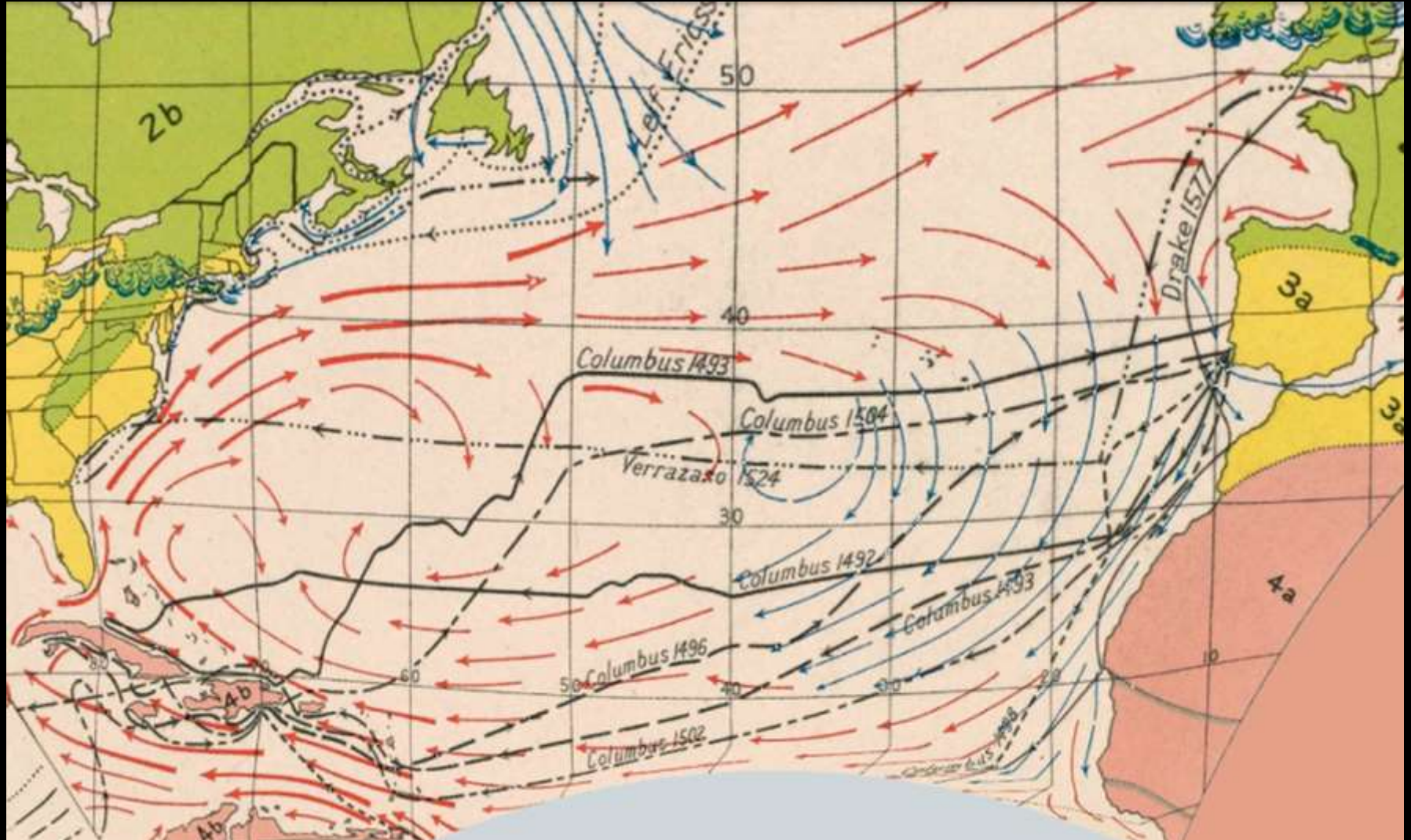
“Tis generally observed by Seamen, that in all Places where Trade winds blow, the Current is influenced by them, and moves the same way with the Winds;”



# Global Geography of Nature – Humboldtian Science

## Explore, Collect, Measure, Connect

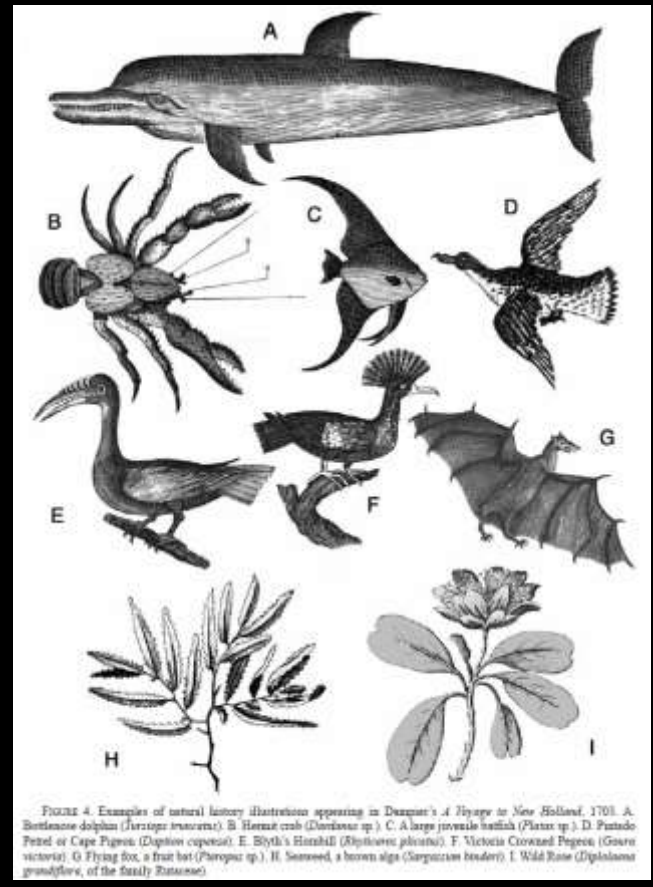
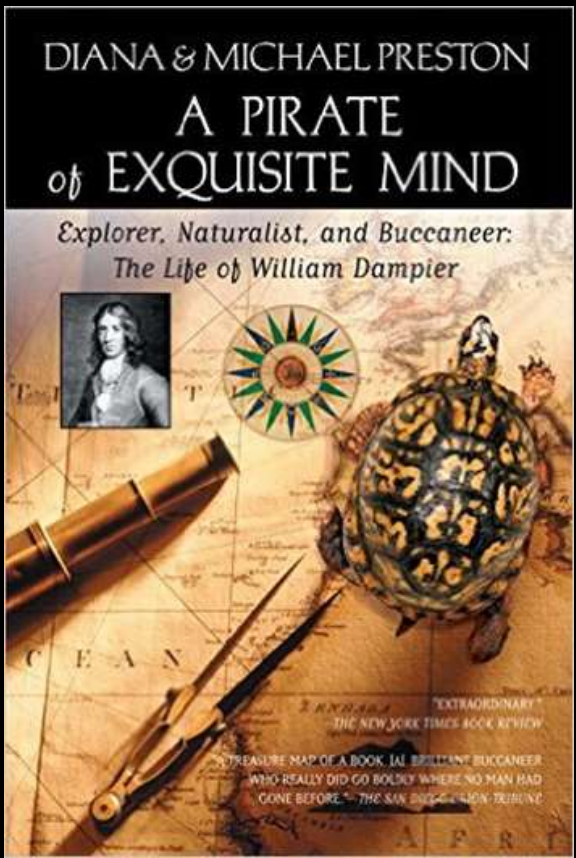
“the accurate measured study of widespread but interconnected real phenomena in order to find a definite law and a dynamic cause”



# Humboldtian Scientific Traveler – William Dampier

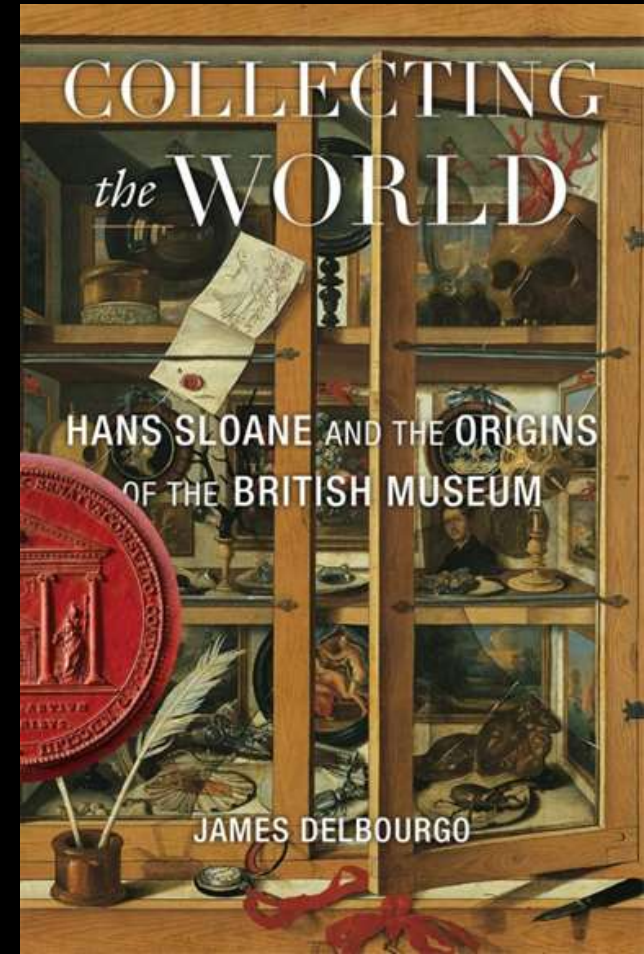
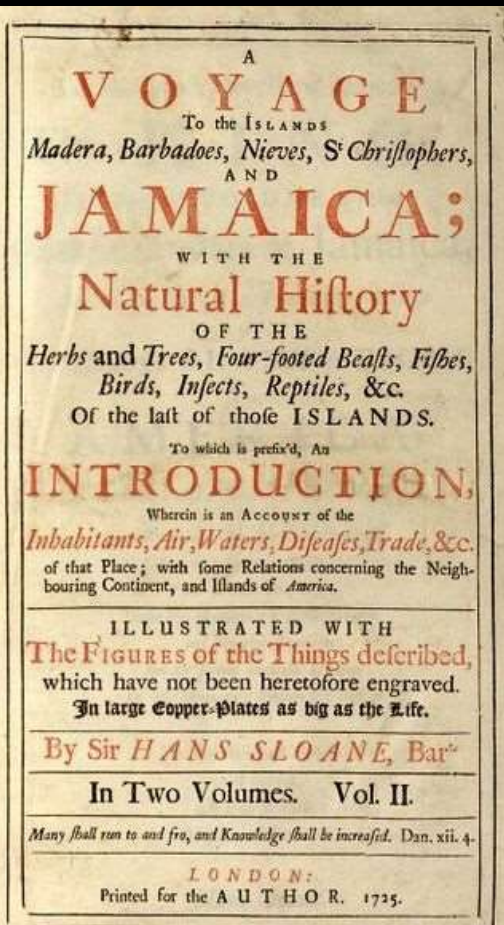
## Explore, Collect, Measure, Connect

- The first naturalist to visit all 5 continents
- The first naturalist of Australia (New Holland)
- The first Englishman to the Galapagos
- The first to use the term “sub-species”
- The first to describe zebras, marijuana, breadfruit, avocado
- The first to identify cochineal as an insect not a seed



# The Great Collector - Hans Sloane 1660-1753

- Appointed physician to Governor of Jamaica 1687 and spends 15 months collecting and exploring
- *Natural History of Jamaica* 1707
- Succeeded Isaac Newton as President of the Royal Society 1727–1741
- Purchases other collections - the founding core of British Museum



# The Great Collector - Hans Sloane 1660-1753

“Invents” and sells Sloane’s Milk Chocolate – Cadbury Brothers 1800s

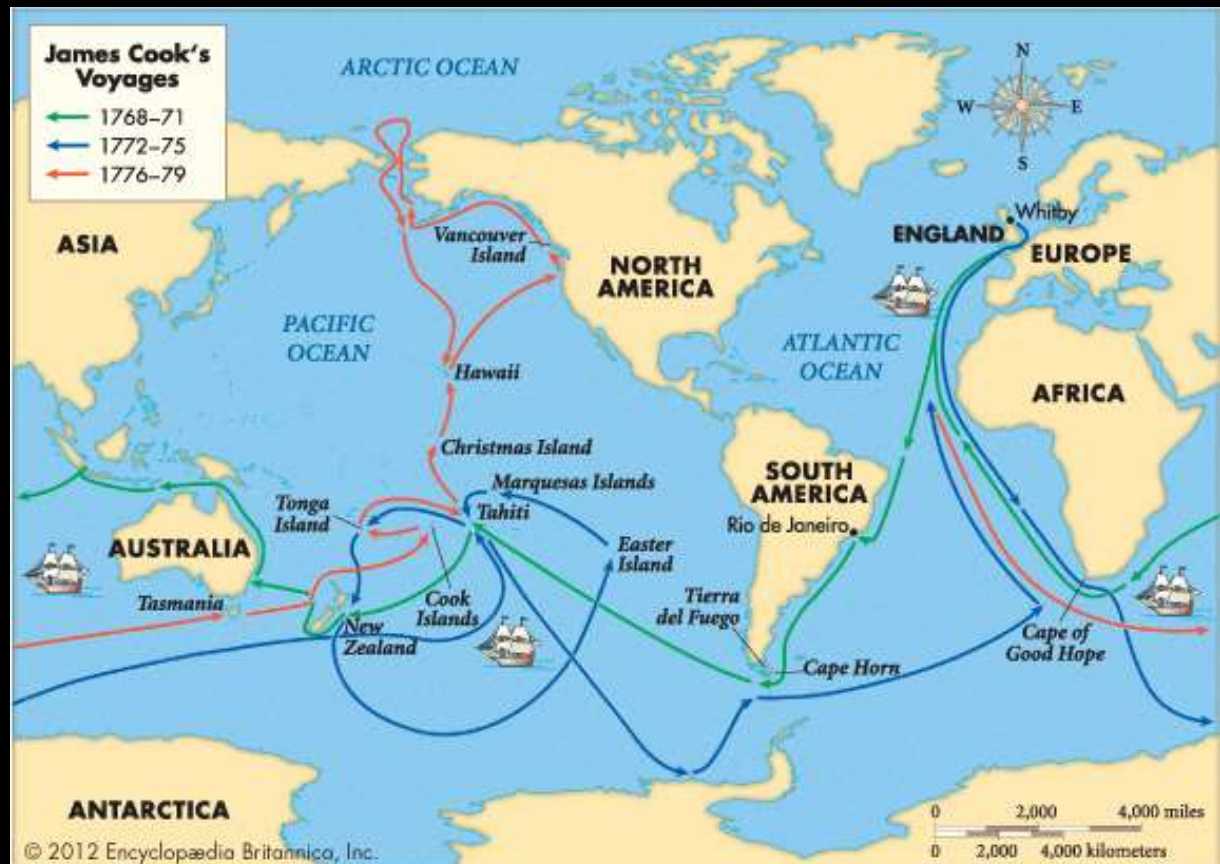
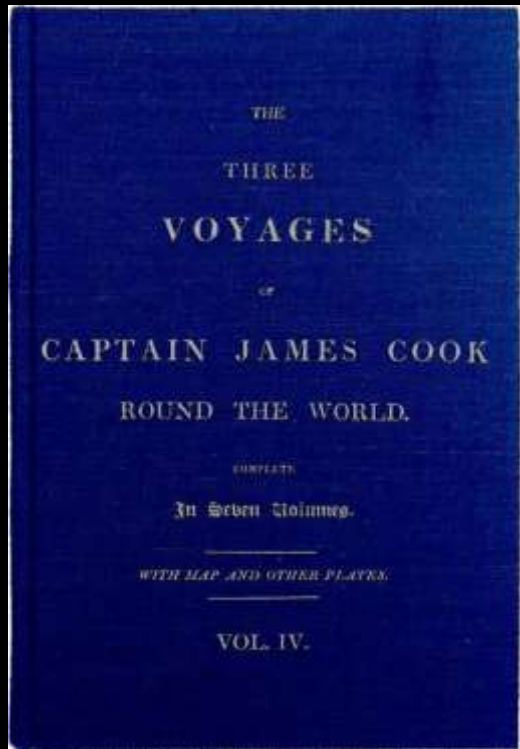


# The Imperial Scientific Traveler Captain James Cook 1728 – 1779

First voyage (1768–71) Transit of Venus, Australia  
Joseph Banks and Daniel Solander

Second voyage (1772–75) Near Antarctica  
Johann Reinhold Forster and Georg Forster

Third voyage (1776–79) Hawaii and Alaska  
Killed in Hawaii



# Scientific Travel and Botanical Collecting

## Joseph Banks 1743-1820

### Three scientific voyages

- HMS Niger (1766-67) to Canada – Newfoundland and Labrador
- HMS Endeavour (1768-1771) with Captain James Cook to the Southern Pacific, New Zealand, and Australia collecting with Daniel Solander
- HMS Sir Lawrence (1772) Hebrides, Iceland, Orkney Islands

Founds the Royal Botanic Gardens at Kew and leads the Royal Society

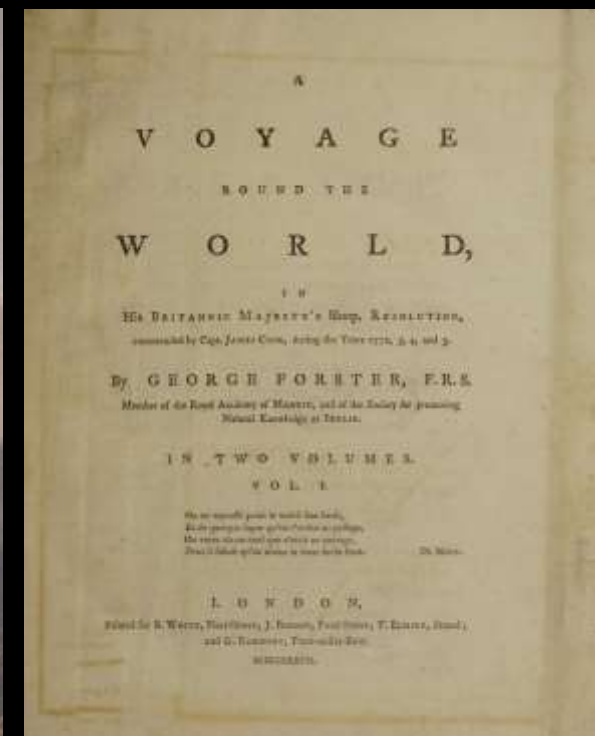
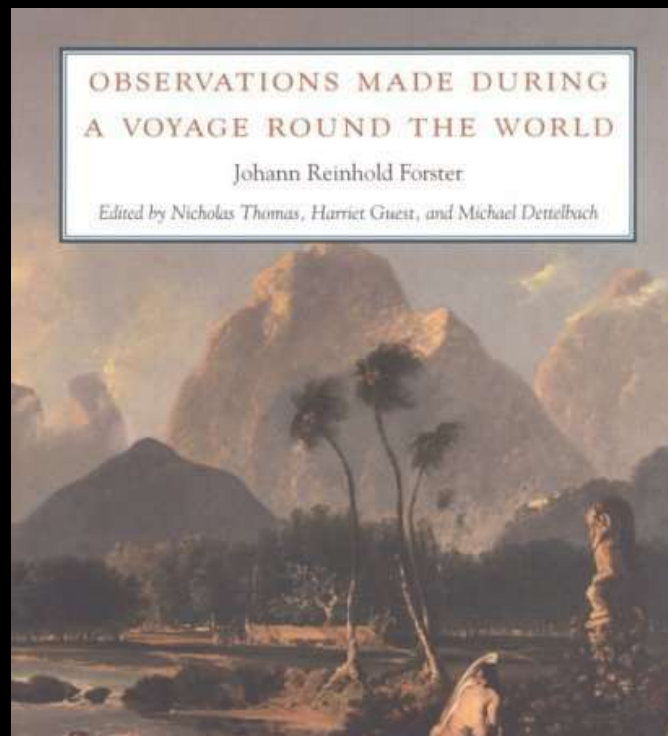


# Humboltian Scientific Travelers – Observation and Narrative

Johann Reinhold Forster 1729-98

Georg Forster 1754-1794

- They emigrated to England in 1766. Both were invited to accompany Capt. James Cook on his second voyage around the world (1772–75).
- J. Reinhold Forster *Observations Made during a Voyage round the World* (1778)
- Georg Forster *A Voyage Towards the South Pole and Round the World* (1777)
- Georg admitted to the Royal Society at the age of 22





# Humboldt's Mentor – Georg Forster

## Science and Liberty - Imperialism and Freedom

### French Revolution 1789- 1794

- Georg meets Humboldt in 1789 when Humboldt studies at University of Göttingen
- Takes Humboldt for a journey March – July 1790 to the Netherlands, France, England – introduces him to Joseph Banks
- Forster publishes account of their journey *Views of the Lower Rhine, Brabant, Flanders* (three volumes, 1791–94)
- Republic and Liberty - Early 1793 – Helps lead the Mainz Republic - defeated by July 1793
- He dies in exile in Paris 1794
- “All peoples of the earth have equal claims to my good will ... and my praise and blame are independent of national prejudice.” Georg Forster



ALEJANDRO DE HUMBOLDT  
(1796)

# Humboldt and Forster – Nature is the Domain of Liberty

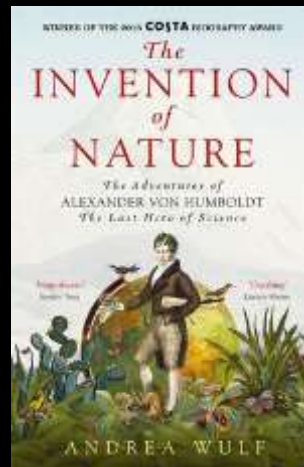
Humboldtian Science = Cosmopolitan science

International collaboration, Friendship, Mutual Support, Mentorship

“Nature is the domain of liberty,’  
Humboldt said, because nature’s balance  
was created by diversity which might in  
turn be taken as a blueprint for political  
and moral truth.

Everything, from the most unassuming  
moss or insect to elephants or towering  
oak trees, had its role, and together they  
made the whole. Humankind was just  
one small part.”

*Wulf Invention of Nature*



# International Collaboration

## Botanical Collecting, Banks and Humboldt

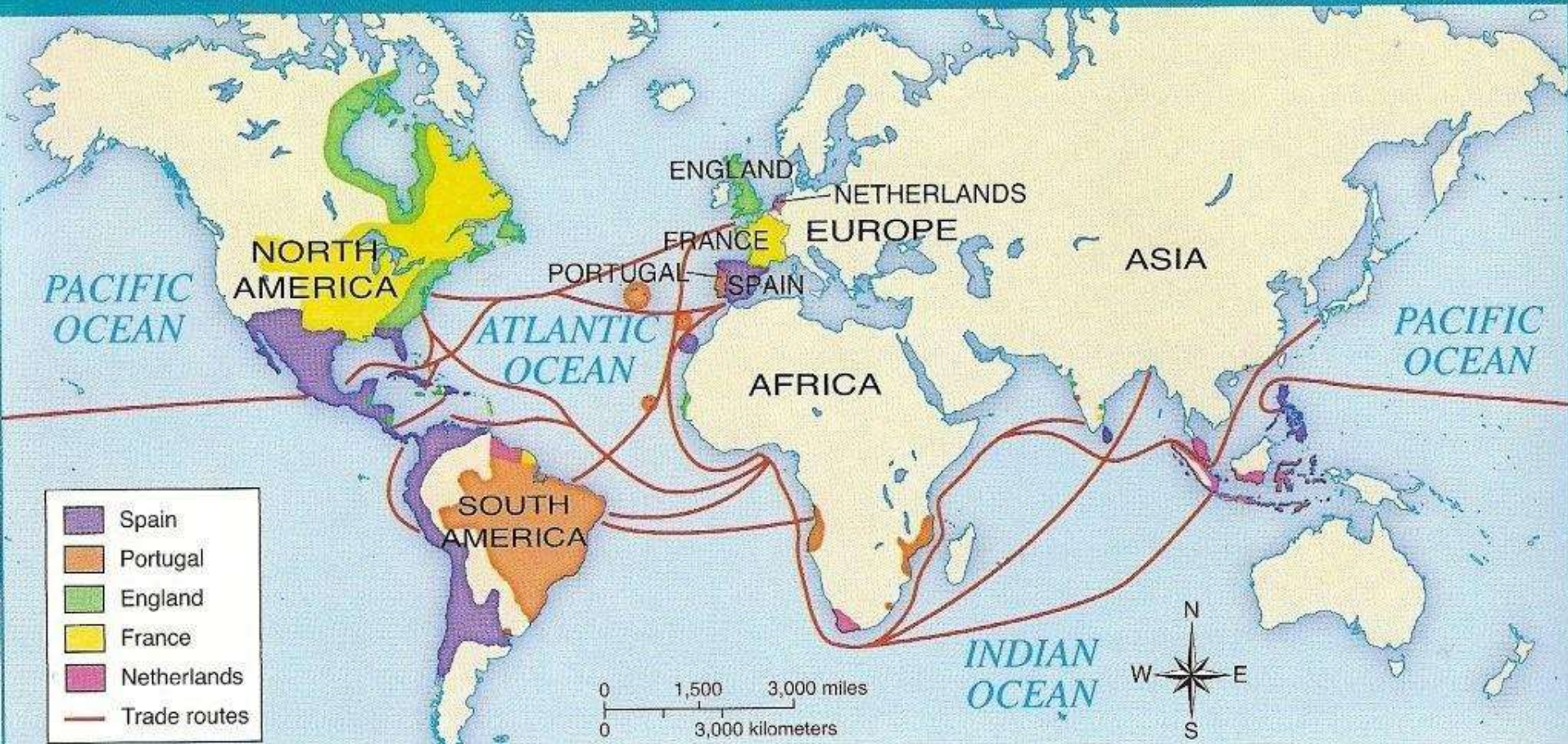
Banks met Humboldt in 1790

- On his American expedition, Humboldt arranged for specimens be sent to Banks, should they be seized by the British.
- Banks and Humboldt remained in touch until Banks's death, aiding Humboldt by mobilizing his wide network of scientific contacts to forward information to Humboldt.
- Both men believed in the internationalism of science.
- Banks – Science and the British Empire – Kew Gardens “a great botanical exchange house for the Empire”
- Humboldt – Science and International Cooperation



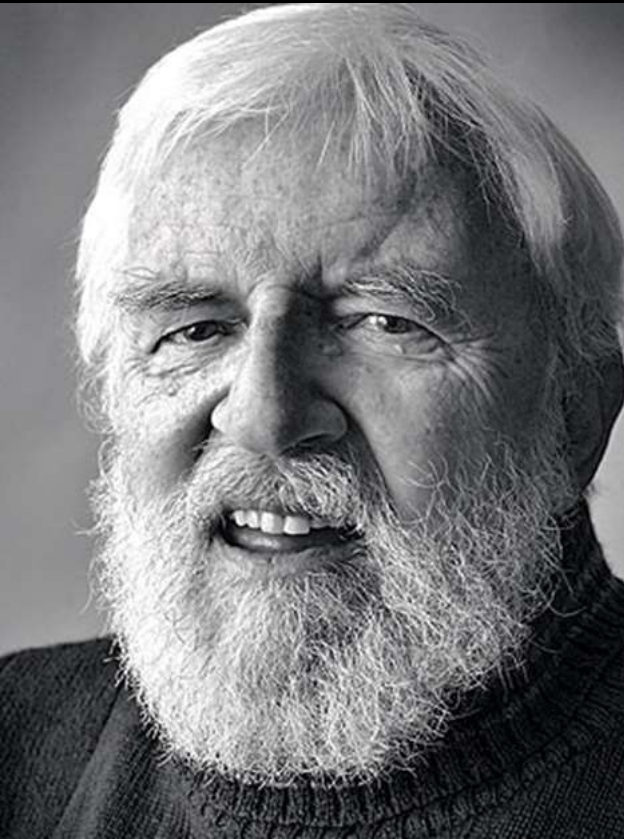
# Ecological Imperialism

Major European Trade Routes, About 1750

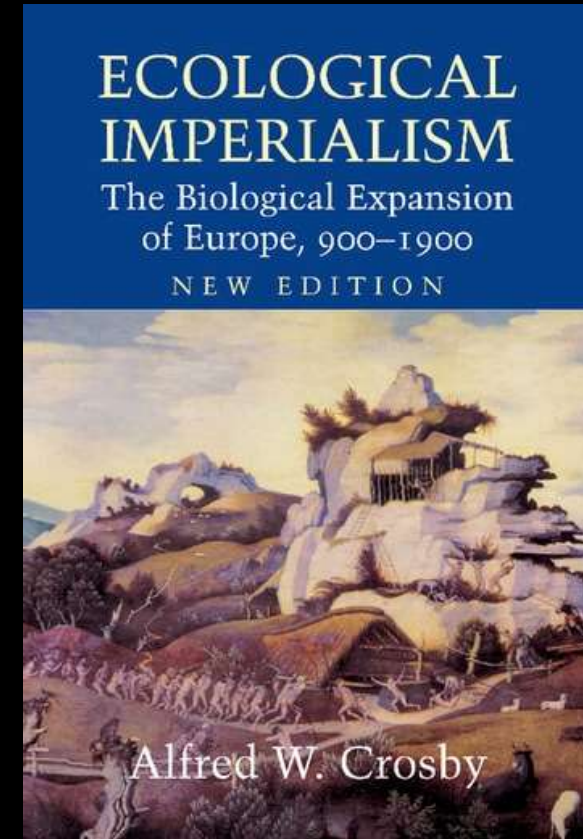


# Ecological Imperialism and the Geography of Nature

“What in heaven’s name is the reason that the sun never sets on the empire of the dandelion?”



Alfred W. Crosby  
1931-2018

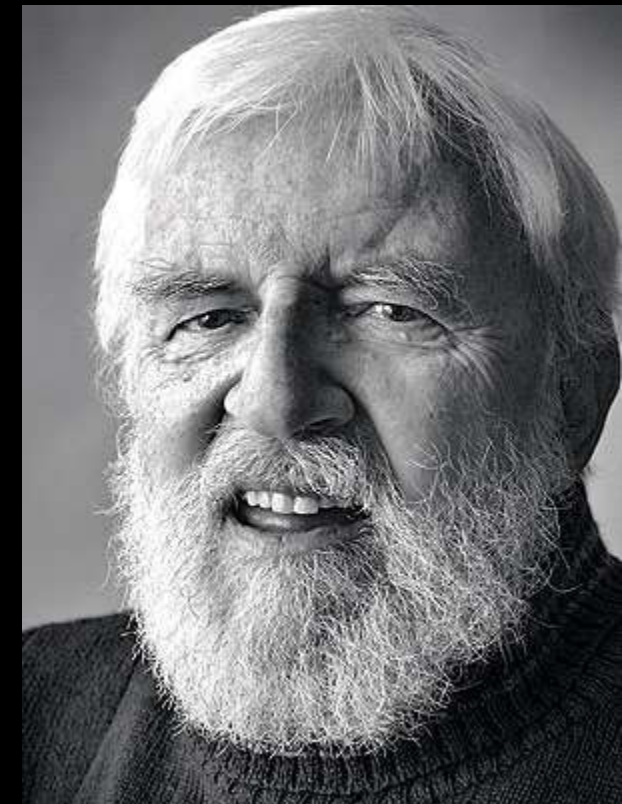
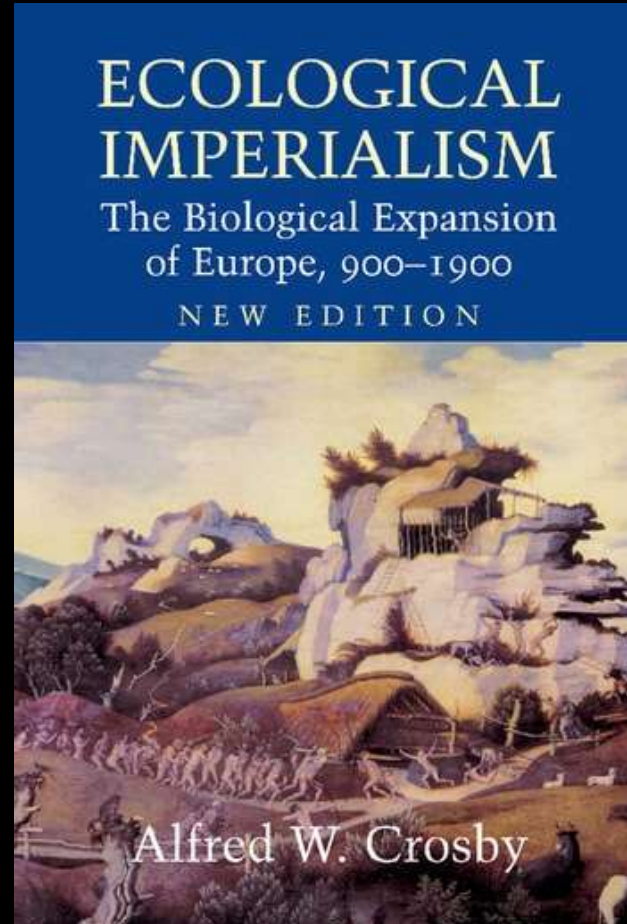
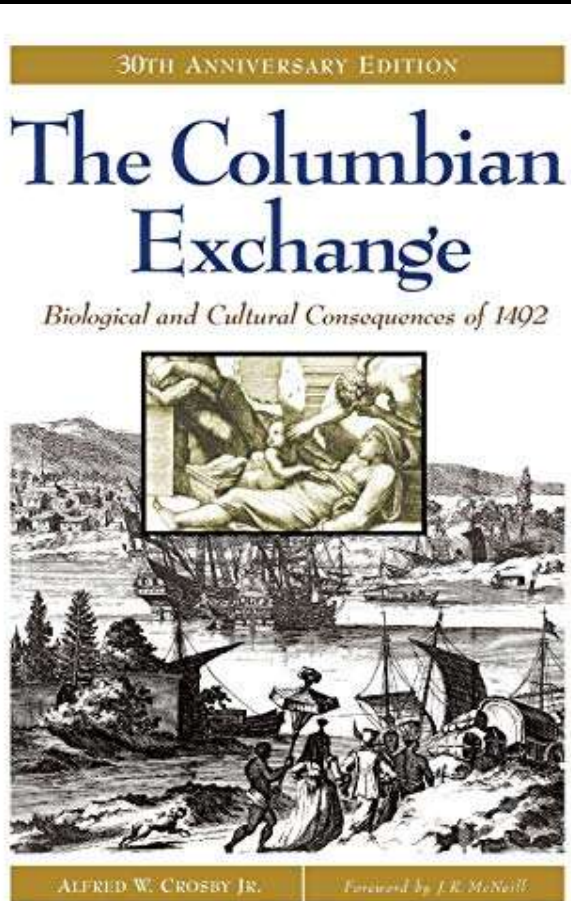


# The Columbian Exchange and Ecological Imperialism

*The Columbian Exchange: Biological and Cultural Consequences of 1492 (1972)*

*Ecological Imperialism: Biological Expansion of Europe, 900-1900 (1986)*

## Environmental History



Alfred W. Crosby  
1931-2018

# Discovery of New World Wilderness And the Columbian Exchange



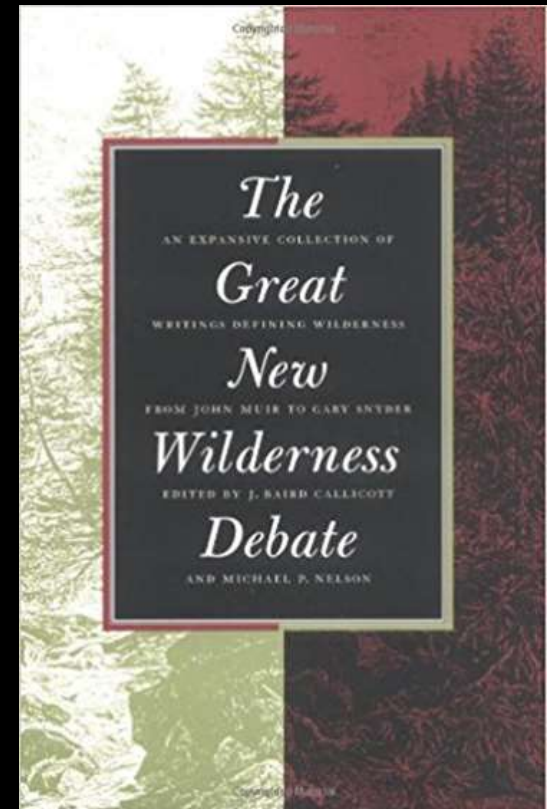
# The Pristine Myth: The Landscape of the Americas in 1492

William M. Denevan

Department of Geography, University of Wisconsin

**Abstract.** The myth persists that in 1492 the Americas were a sparsely populated wilderness, “a world of barely perceptible human disturbance.” There is substantial evidence, however, that the Native American landscape of the early sixteenth century was a humanized landscape almost everywhere. Populations were large. Forest composition had been modified, grasslands had been created, wildlife disrupted, and erosion was severe in places. Earthworks, roads, fields, and settlements were ubiquitous. With Indian depopulation in the wake of Old World disease, the environment recovered in many areas. A good argument can be made that the human presence was less visible in 1750 than it was in 1492.

*Annals of the Association of American Geographers*, Vol. 82, No. 3, The Americas before and after 1492: Current Geographical Research. (September 1992)

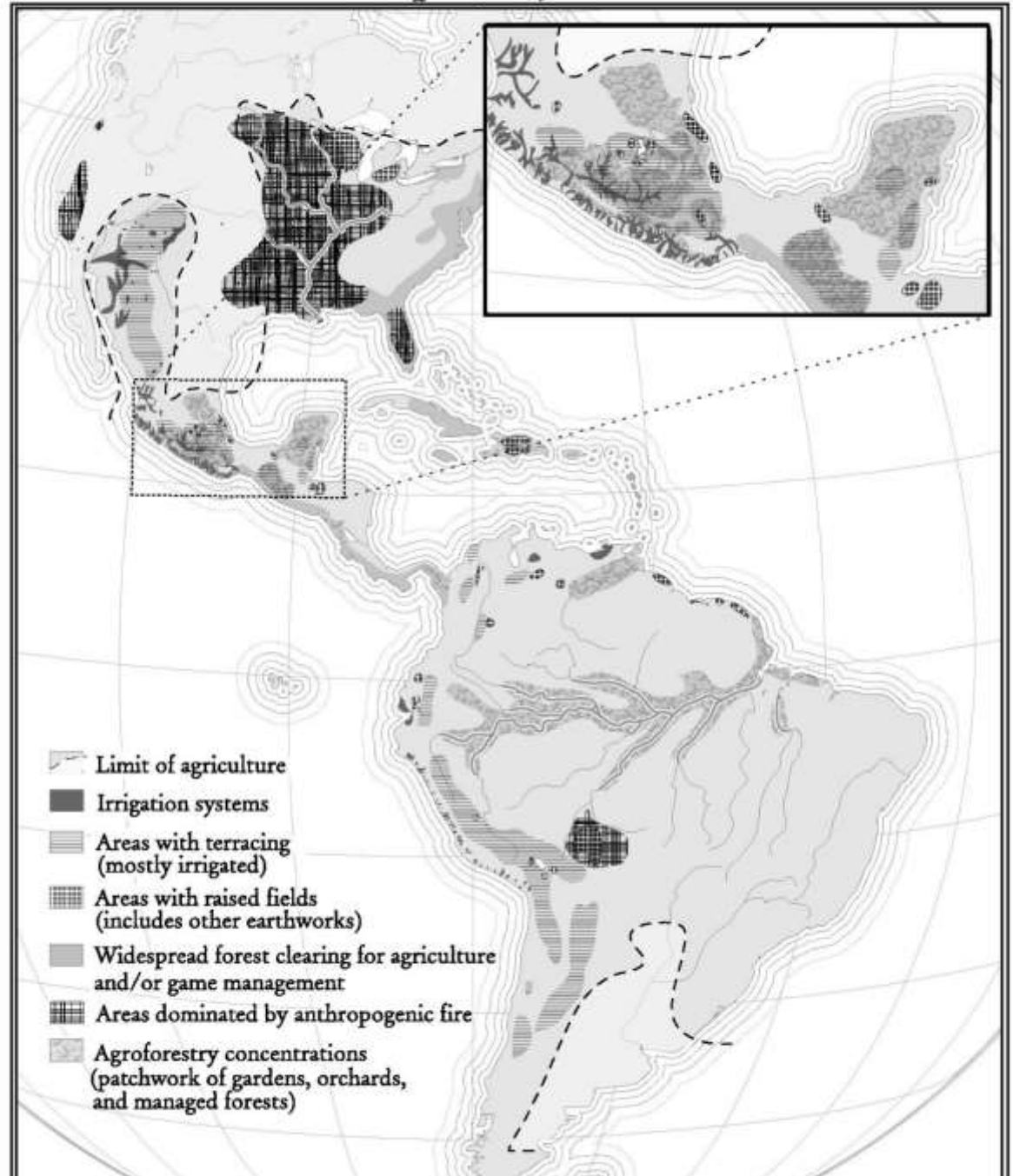




# Wilderness and Humanized Landscapes of the New World



## Humanized Landscapes, 1491 A.D.

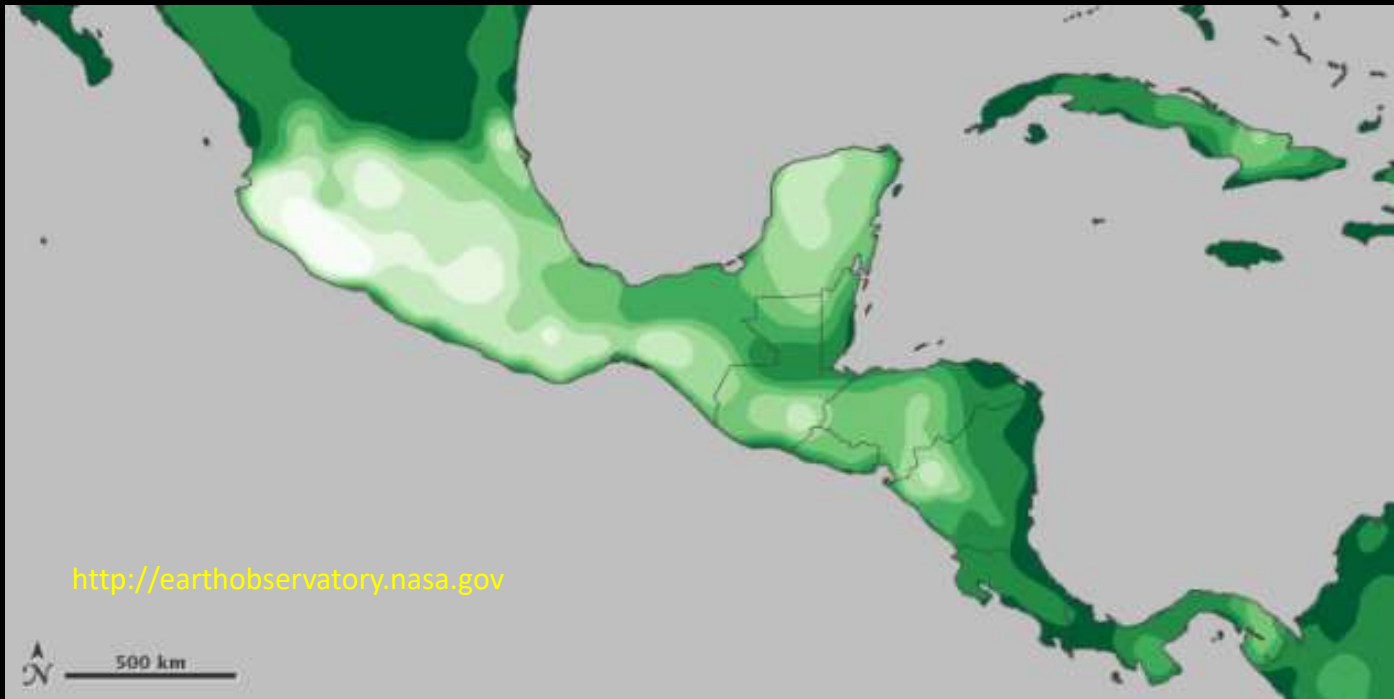


# Humanized Landscapes

Transformation  
950 A.D.



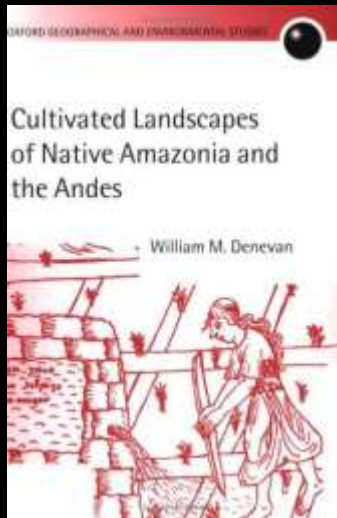
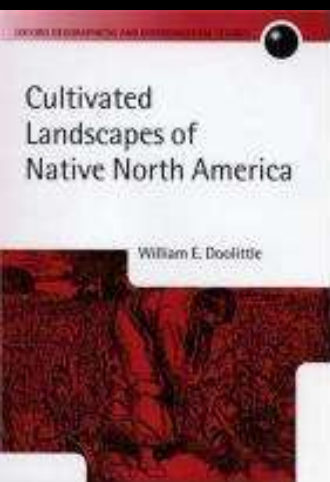
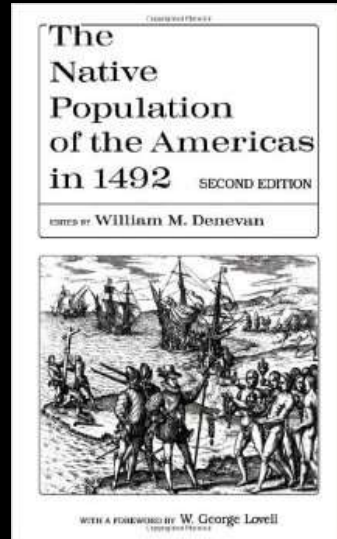
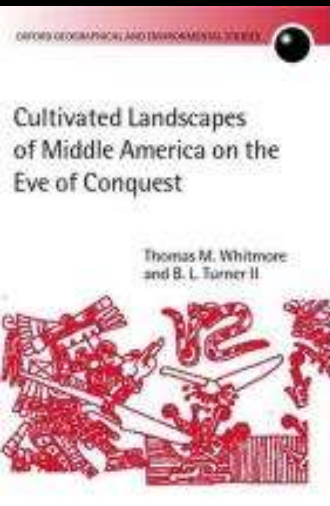
How little native forest remained at the end of the Mayan period around 950 AD.  
By cutting down the forest, the Mayans changed their local climate.



# Cultivated Landscapes of the Americas – The Native Population of the Americas in 1492

The American population in 1492 was around 54 million.

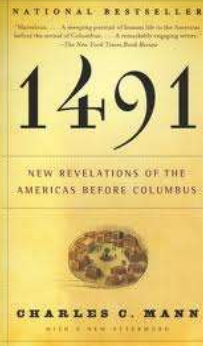
The population north of Mexico - current estimates range from 8-10 million.



# THE COLUMBIAN EXCHANGE

NORTH AMERICA

EUROPE

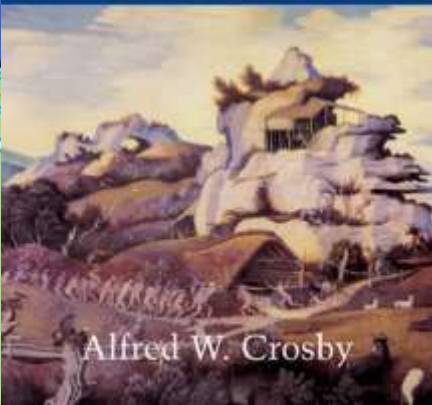


“Until about 200 million years ago Eurasia and the Americas were a single landmass called Pangaea. It broke apart and for millions of years the parts had little communication. As Crosby put it, Columbus initiated the process of knitting back together the seams of Pangaea.

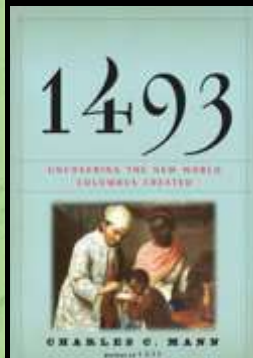
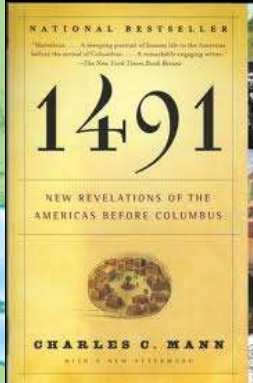
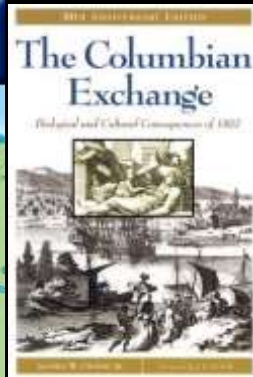
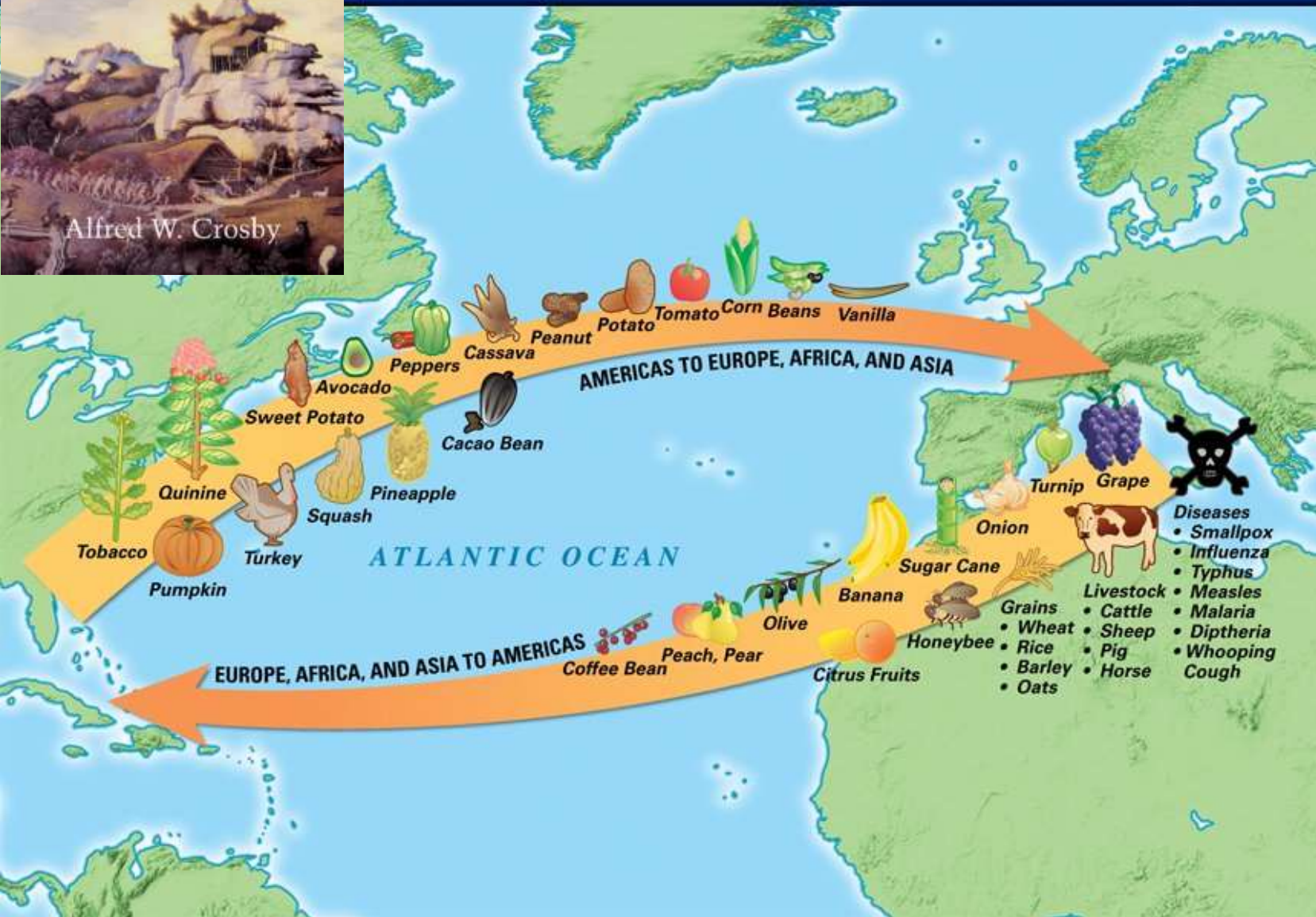
Ever since 1492, the hemispheres have become more and more alike, as people mix the world’s organisms into a global stew through the Columbian Exchange.”

# ECOLOGICAL IMPERIALISM

The Biological Expansion of Europe, 900-1900  
NEW EDITION



# Reshaping Old World and New World Natural History 1492-1799

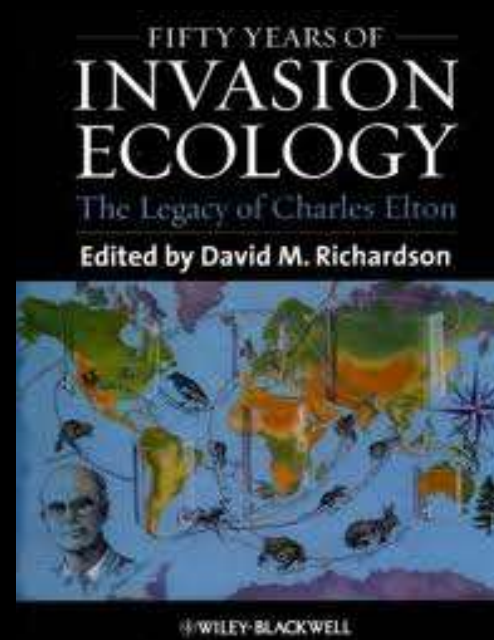
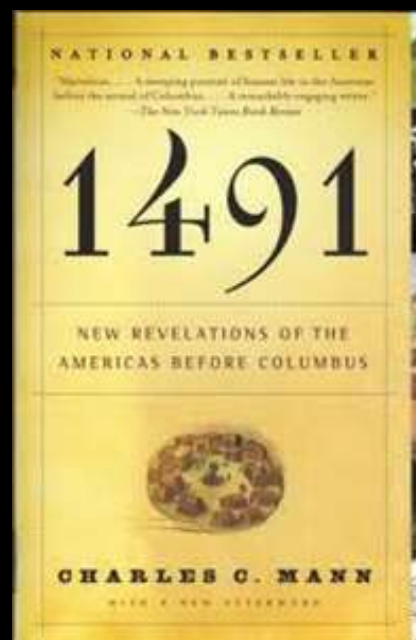
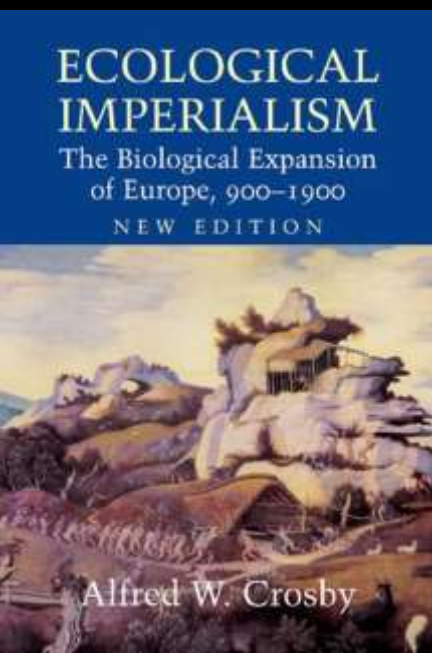


# Ecological Imperialism – Ecological Release

“Columbus set off an ecological explosion of a magnitude unseen since the Ice Ages. Some species were shocked into decline (most prominent among them *Homo sapiens*, which in the century and a half after Columbus lost a fifth of its number, mainly to disease).

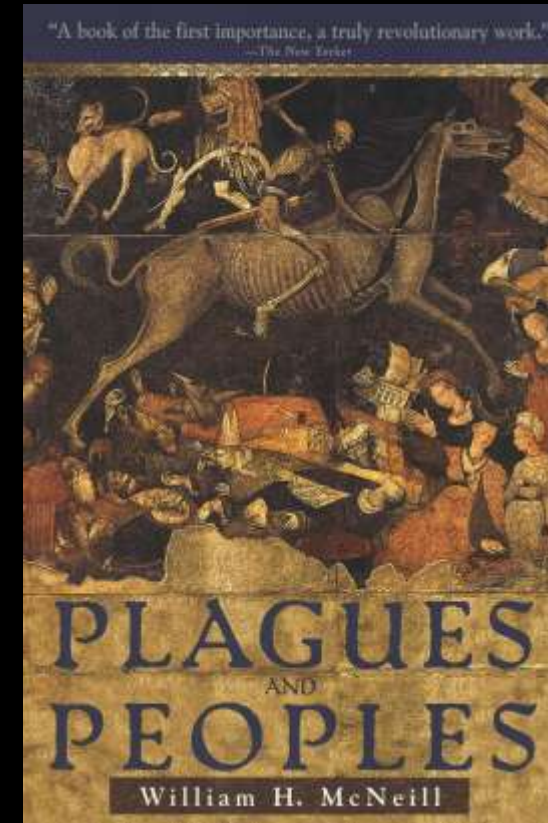
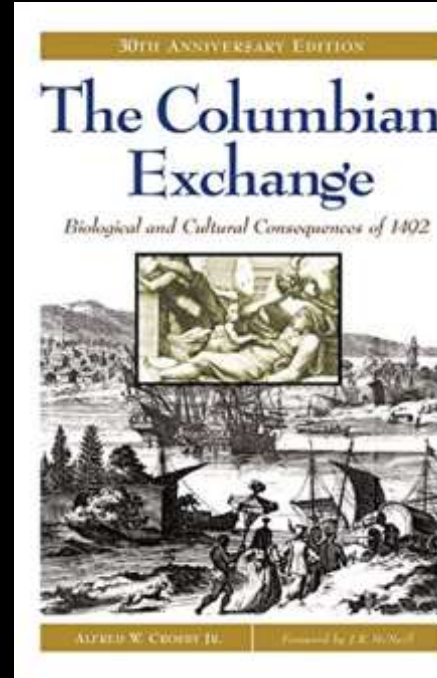
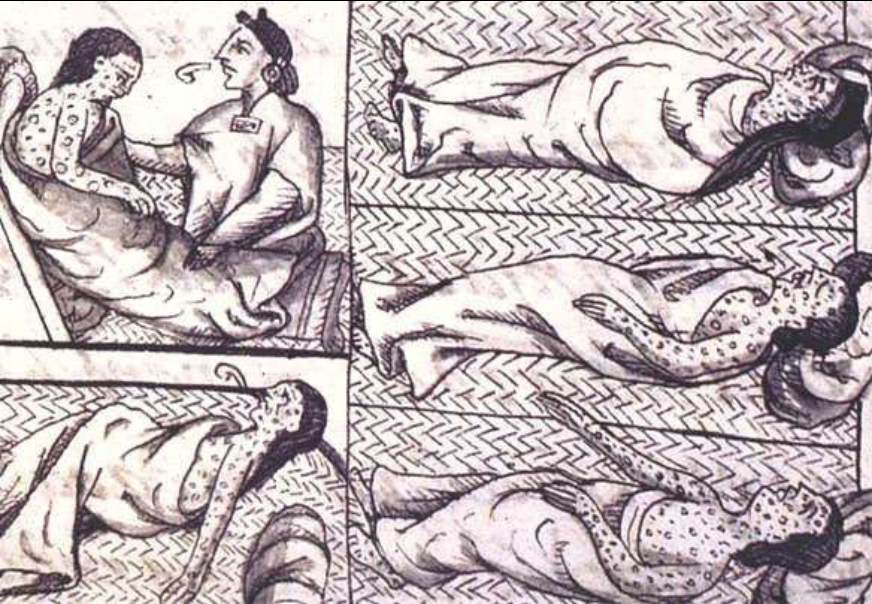
Others stumbled into new ecosystems and were transformed into environmental overlords: picture-book illustrations of what scientists call ecological release.”

Mann, 1491



# The Columbian Exchange – 1492 onwards

## Disease and Depopulation



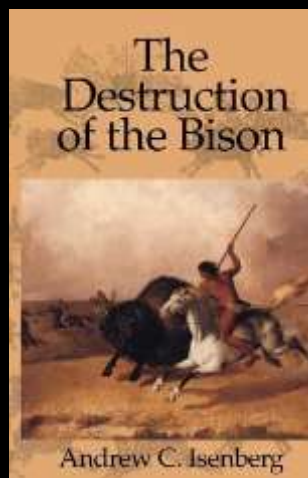
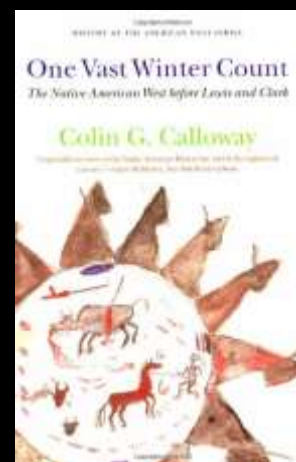
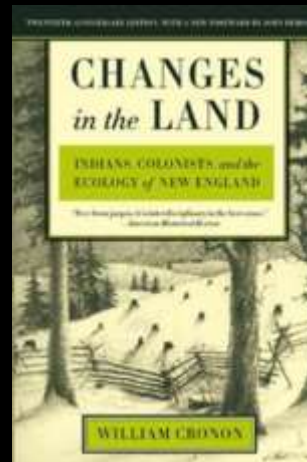
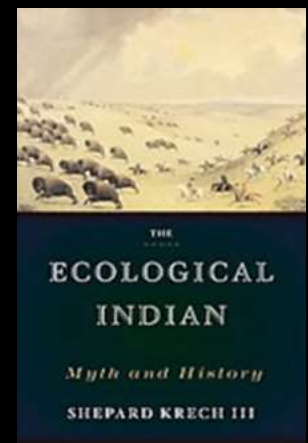
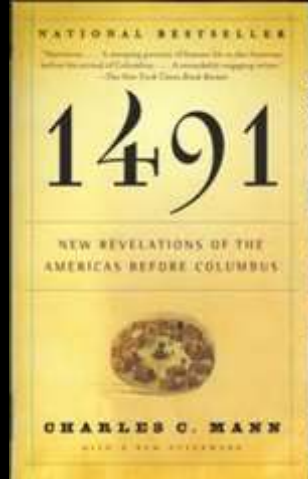
Depopulation of Native Americans in Florida, 1519-1617			
Year	Disease	Percent Decline	Estimated Population
1517			722,000
1520	Smallpox	-50	361,000
1528	Measles	-50	180,500
1545	Bubonic plague	-12.5	158,000
1559	Influenza	-5	150,000
1564-70	Influenza	-10	135,000
1585	Unidentified	-10	121,500
1586	Cape Verde Island fever	-20	97,200
1596	Measles	-25	72,900
1613-17	Bubonic plague	-50	36,450

# 1491 Native Americans as Keystone Species

## Humanized Landscape

“Until Columbus, Indians were a keystone species in most of the hemisphere. Annually burning undergrowth, clearing land and replanting forests, building canals and raising fields, hunting bison and netting salmon, growing maize, manioc, and the Eastern Agricultural Complex.

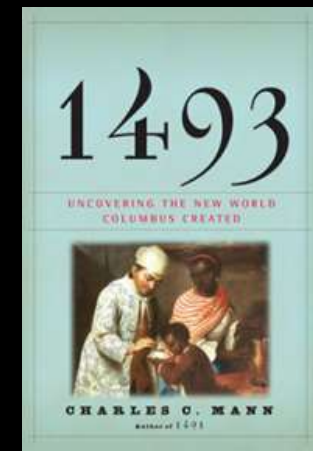
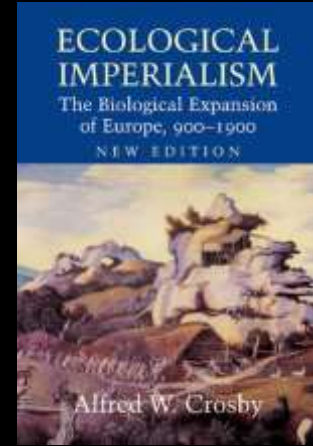
Native Americans had been managing their environment for thousands of years... But all of these efforts required close, continual oversight. In the sixteenth century, epidemics removed the boss... Not only did invading endive and rats beset them, but native species, too, burst and blasted, freed from constraints by the disappearance of Native Americans.” Mann, 1491





# Global Ecological Transformation

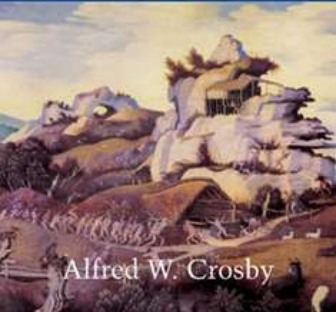
- Jamestown – rats, clover, bluegrass
- Endive and spinach escaped from colonial gardens and grew into impassable six-foot thickets on the Peruvian coast - Mint overwhelmed Andean valleys
- In the Pampas of Argentina Charles Darwin found hundreds of square miles strangled by feral artichoke in the 1830s and found that peach wood from invasive peach trees was the main supply of firewood for Buenos Aires.
- Peaches invade the Southeast – 1700s farmers worried that the Carolinas and Georgia would be a “wilderness of peach trees”
- Rabbits were introduced to Australia by the First Fleet in 1788



# ECOLOGICAL IMPERIALISM

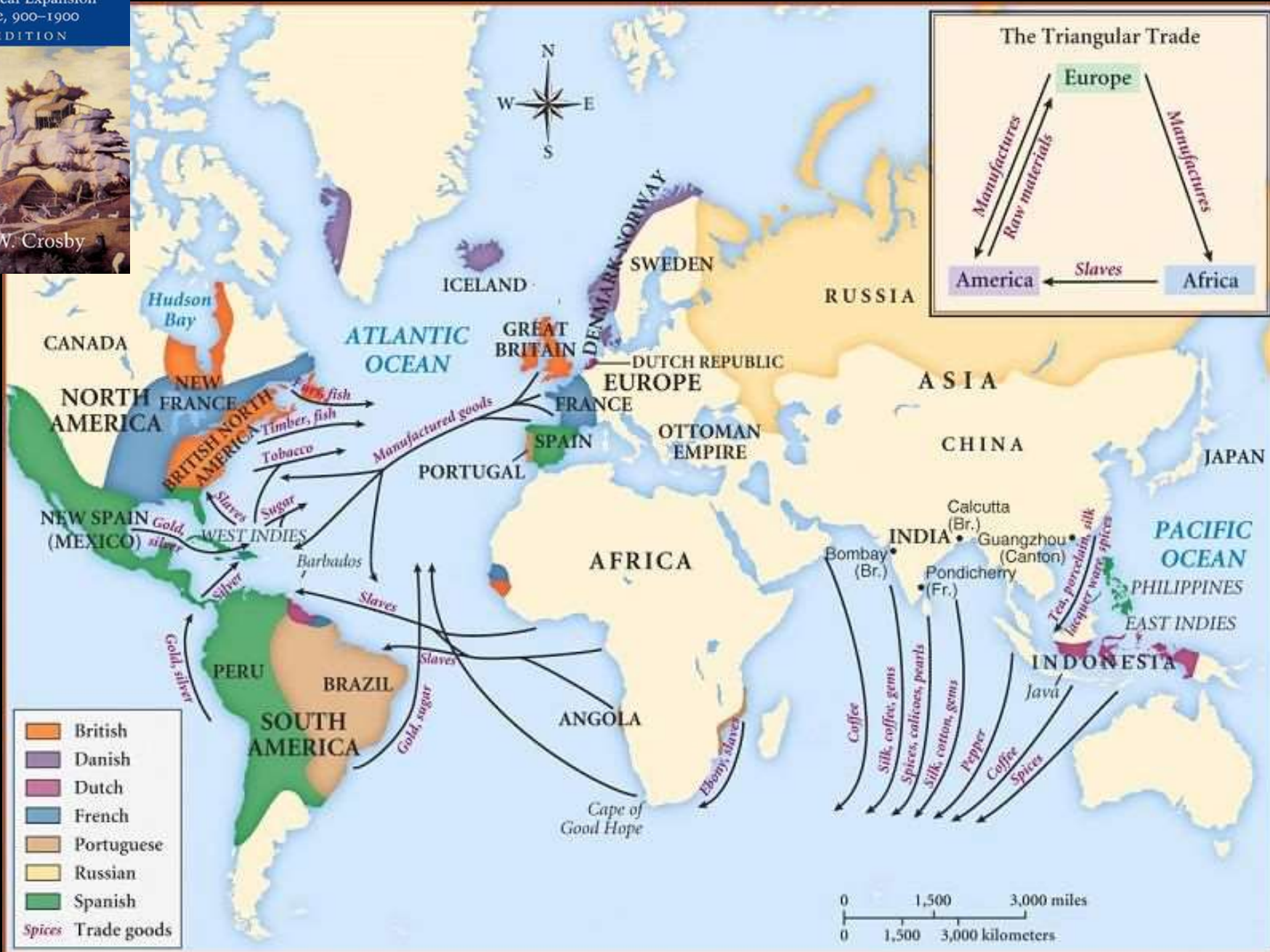
The Biological Expansion of Europe, 900-1900

NEW EDITION



Alfred W. Crosby

# Ecological Imperialism 1600-1800 Global Trade Routes



# The Great Nations of Europe – Randy Newman

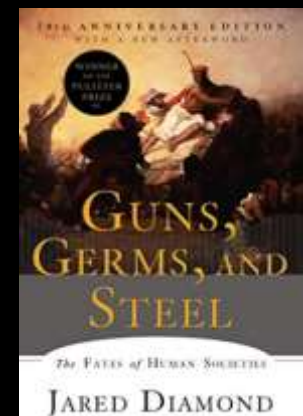
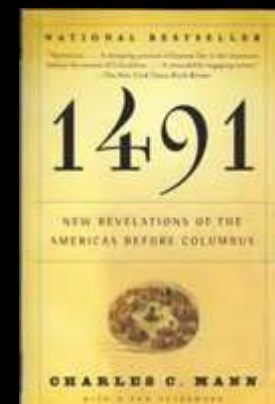
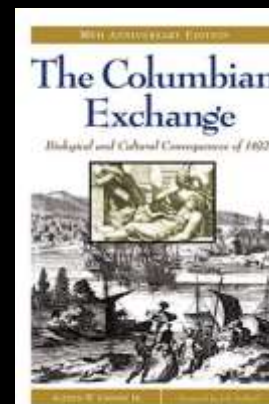
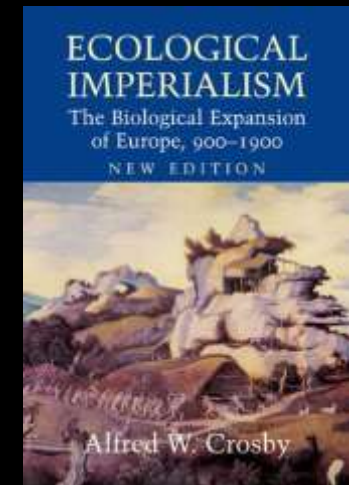
The Great Nations of Europe had gathered on the shore  
they'd conquered what was behind them and now they wanted more  
so they looked to the mighty ocean and took to the western sea  
The great nations of Europe in the 16th century

Hide your wives and daughters, hide the groceries too  
The great nations of Europe coming through

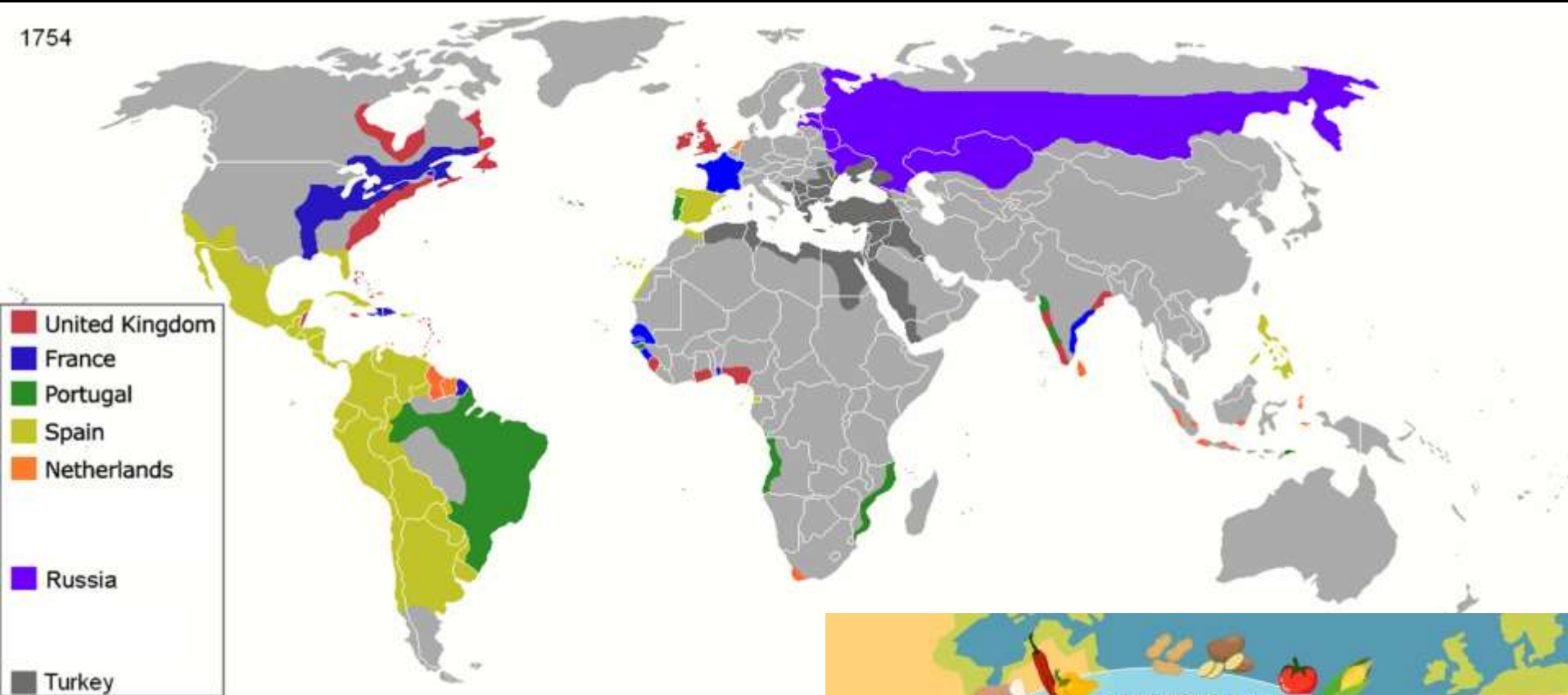
The Grand Canary Islands first land to which they came  
they slaughtered all the canaries there which gave the land its name  
there were natives there called Guanches, Guanches by the score  
bullet's, disease, the Portuguese, they weren't there any more

Columbus sailed for India found Salvador instead  
he shook hands with some Indians and soon they all were dead  
they got tb and typhoid and athlete's foot, diphtheria and the flu  
'scuse me great nations coming through

On *Bad Love* (1999) and *Songbook Vol. 1* (2003)



# The Geography of Nature transformed by European Colonial Expansion 1400s-1700s



Natural Philosophy → Natural History  
Aristotle → Scientific Revolution  
Observation and Description →  
Explaining Order and Change





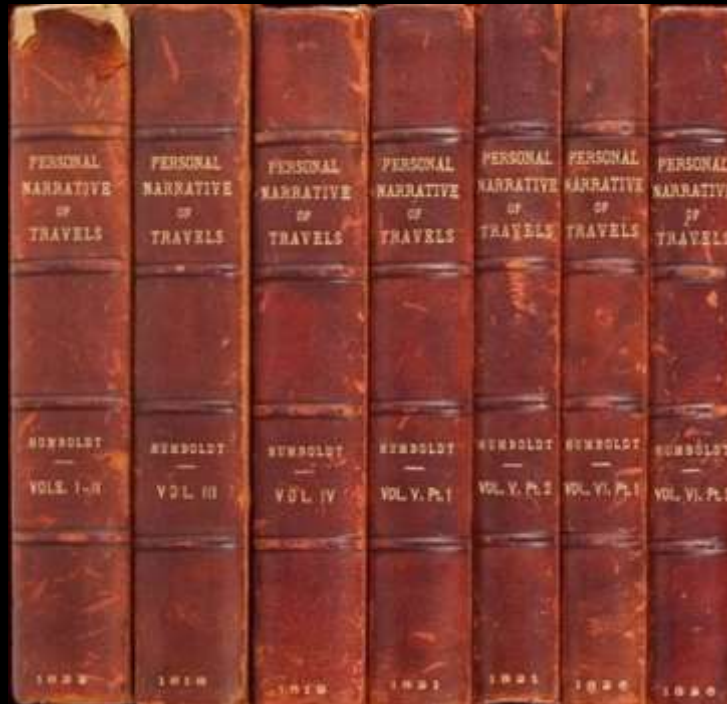


## “Scientific Travelers” – Humboldt and Darwin

Darwin’s epitaph for his hero Alexander von Humboldt, written in a letter to his friend Joseph Hooker in 1881, the year before Darwin’s own death.

“I believe that you are fully right in calling Humboldt the greatest scientific traveler who ever lived. You might truly call him the parent of a grand progeny of scientific travelers, who taken together have done much for science.”

PENGUIN CLASSICS  
CHARLES DARWIN  
VOYAGE OF  
THE *BEAGLE*



# Humboldtian Science and the Geography of Nature

“the accurate measured study of widespread but interconnected real phenomena in order to find a definite law and a dynamic cause”

1. Explore – “Nature speaks and the scientist must go out and listen”
2. Collect – gather data for or against an idea/theory
3. Measure – widespread, accurate, collaborative
4. Connect – detect patterns that point to underlying laws
5. Cosmopolitan science – international collaboration



Applause

