

TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

INTRODUCTION TO THE MARITIME INDUSTRY

2. History and Geography of Maritime Transportation



MARA 205

Professor: Dr. Jean-Paul Rodrigue



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INTRODUCTION TO THE MARITIME INDUSTRY



A. A Brief History of the Maritime Industry

Main Stages of Development of the Maritime Industry

ANTIQUITY

3000 BCE

Horses; Sailing ships; Wheeled carts; Aqueducts

300 BCE – 500 CE

Wheelbarrow; Paved roads; Stirrups; Canals

500 – 1000 CE

Horse collars; Compass

1000 – 1500 CE

Rudder, Locks; Three-mast ships

1500 – 1800 CE

Steam engine (1712); Steam car (1769); Balloons (1783)

1800 – 1850 CE

Steamboat (1807); Bicycles (1816); Surfaced roads (1816); Steam rail (1825); Electric streetcars (1834); Iron hulls (1843)

1850 – 1875 CE

Airships (1852); Compound steam engine (1854); Subway (1863); Pipelines (1864); Internal combustion engine (1866); Asphalt roads (1872)

1875 – 1900 CE

Steam turbine (1884); Gasoline engine (1885); Pneumatic tires (1888); Diesel engine (1895); Trucks (1886)

1900 – 1925 CE

Airplanes (1903); Helicopters (1907); Ford Model T (1908); Dirigibles (1910); Diesel locomotives (1917); Air passenger services (1919)

1925 – 1950 CE

Rockets (1926); Highways (1933); Jet engine (1940); Passenger jet (1949)

1950 – 1975 CE

Intermodal containers (1957); Space travel (1957); Jumbo jets (1966); Supersonic passenger jets (1969); Maglev (1969)

1975 – 2000 CE

Double-stacked rail services (1984); Drones (1991); Hybrid cars (1997)

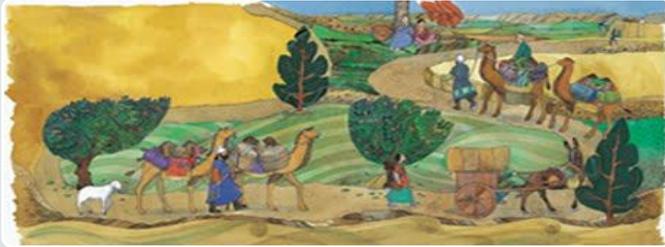
2000 – 2025 CE

Ride-sharing (2011); Self driving vehicles (2014)

TRANSPORTATION INNOVATIONS

Trade Issues in Antiquity

Nature of Trade



- Limited market size geared to the elite.
- High-value commodities (silk, spices, perfumes, gems, gold, silver, ivory).
- Bulk commodities could be traded when maritime transport was available (grain, wine, olive oil).
- Many intermediaries.

Limiting Factors



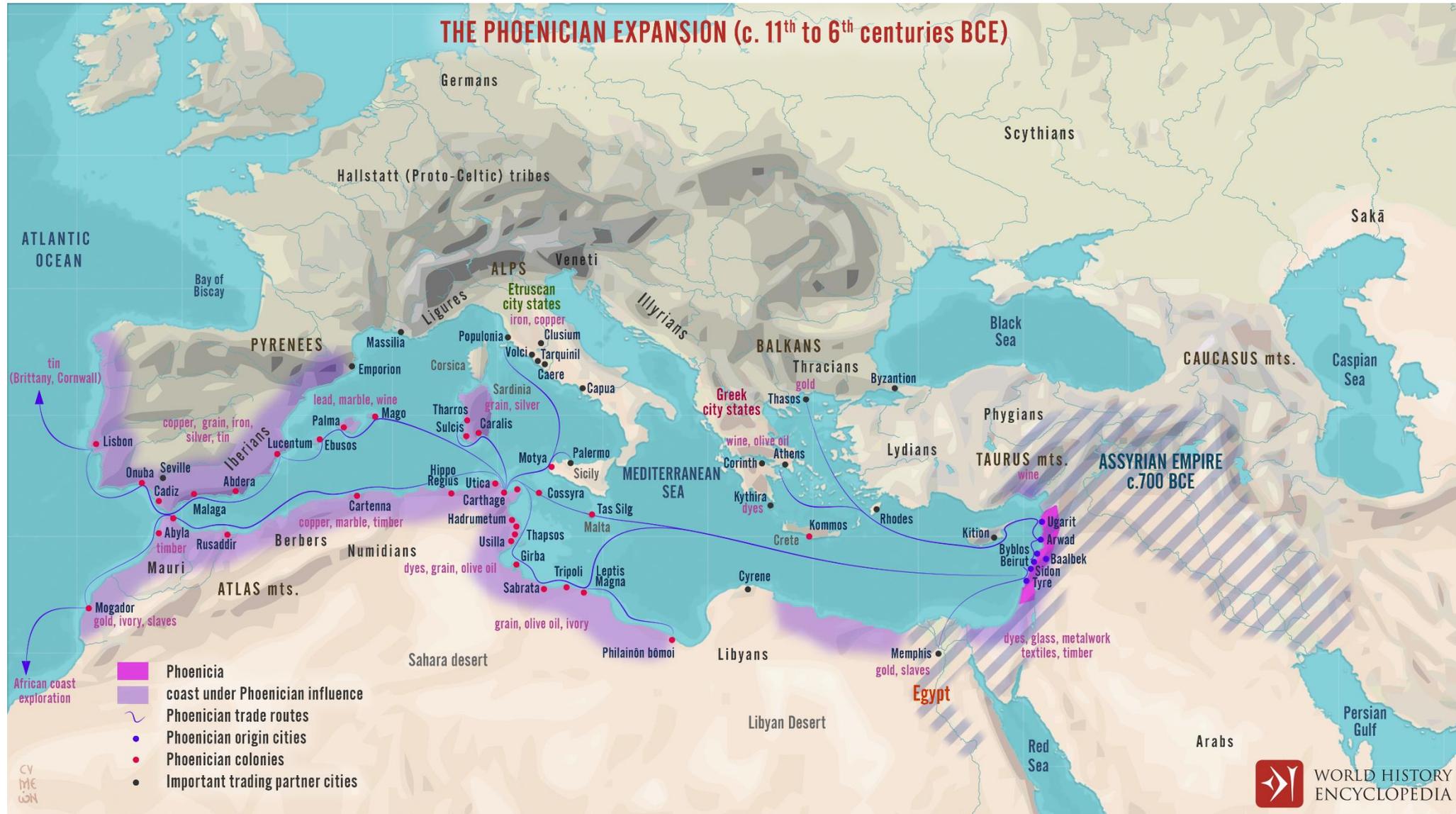
- Limited capacity and speed of inland transportation.
- Diversity of currencies and units of measure.
- High tariffs.
- Unreliable navigation.
- Insecurity / piracy.

© GTS

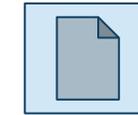


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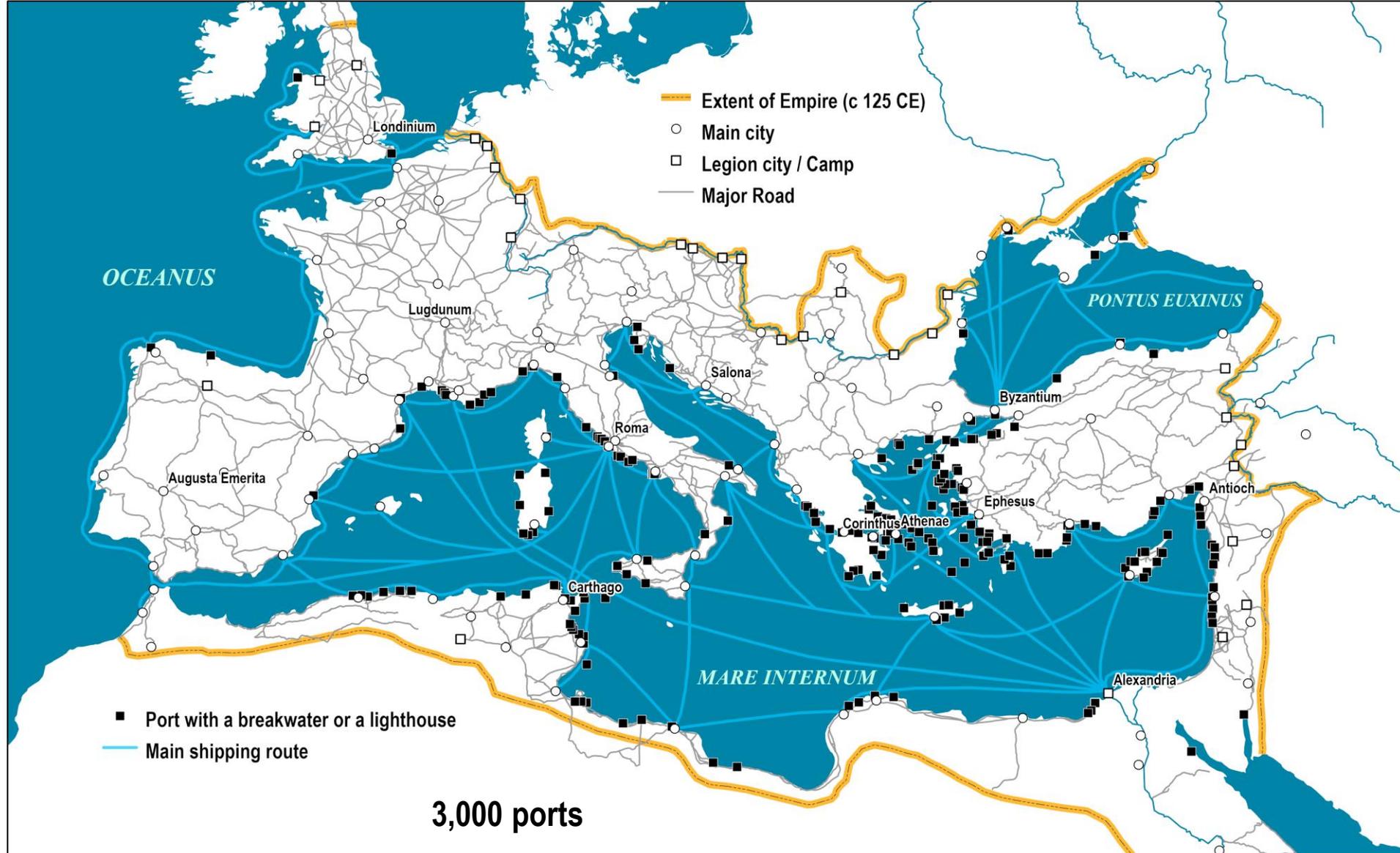
The First Thalassocracy: The Phoenician Empire



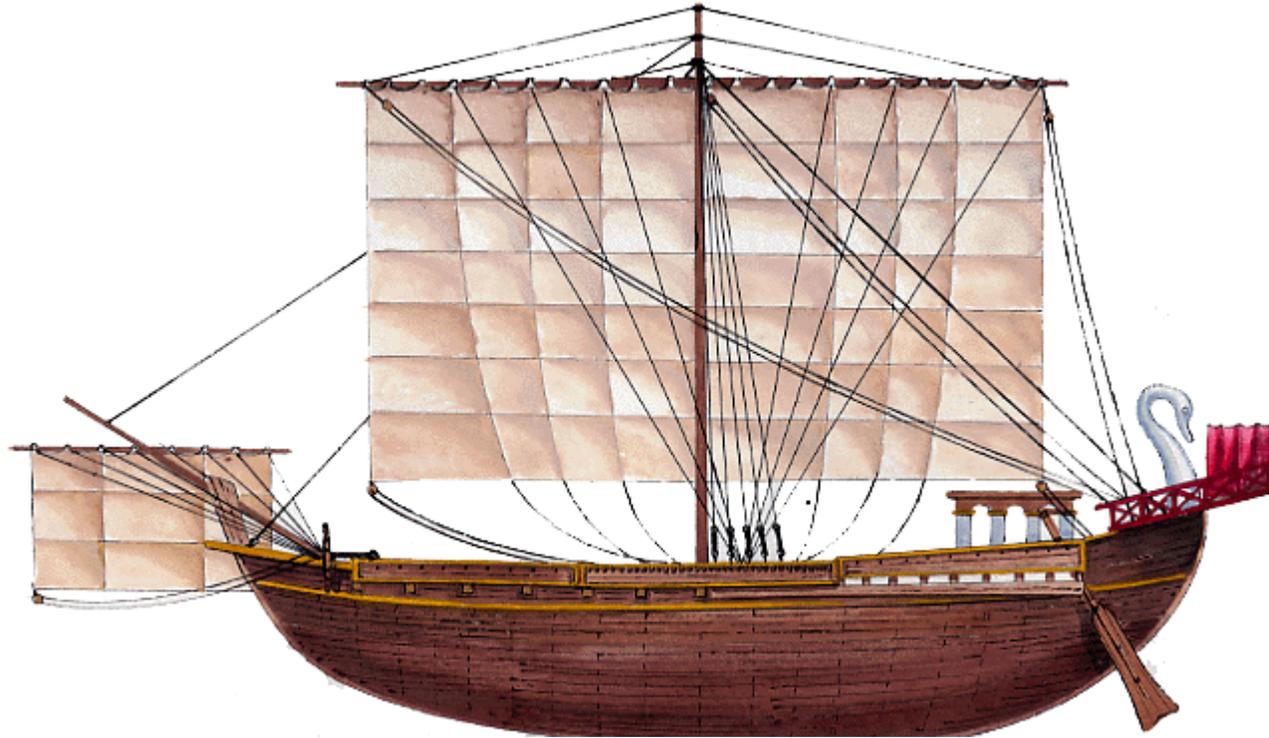
Main Ports of the Roman Empire, c125 CE



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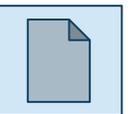
Roman Corbita Merchant Vessel, 2nd Century CE



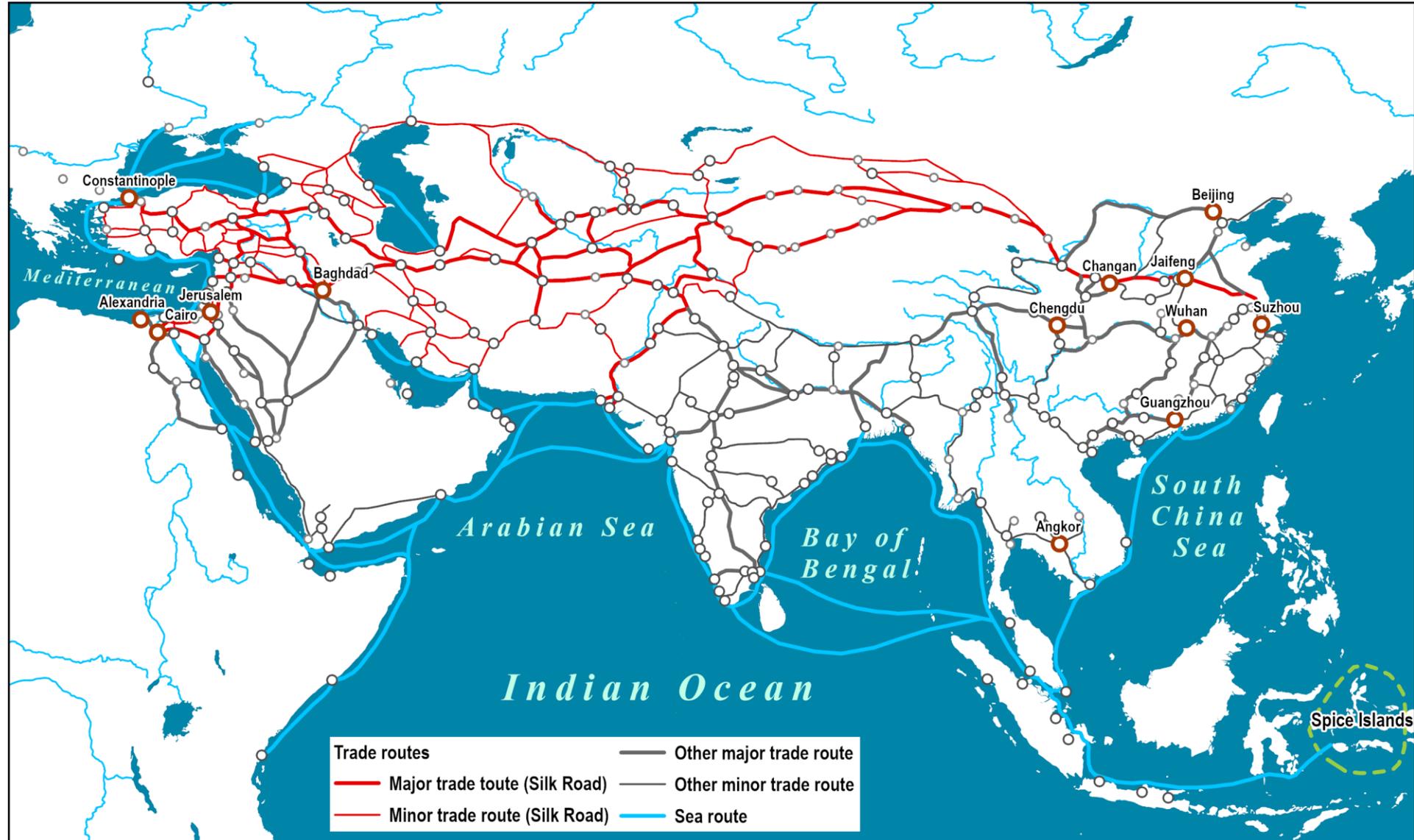
55 x 13 meters

400 tons of carrying capacity (3,000 amphoras)

The Port of Portus, Ancient Rome



The Silk Road and Arab Sea Routes (11th and 12th Centuries)

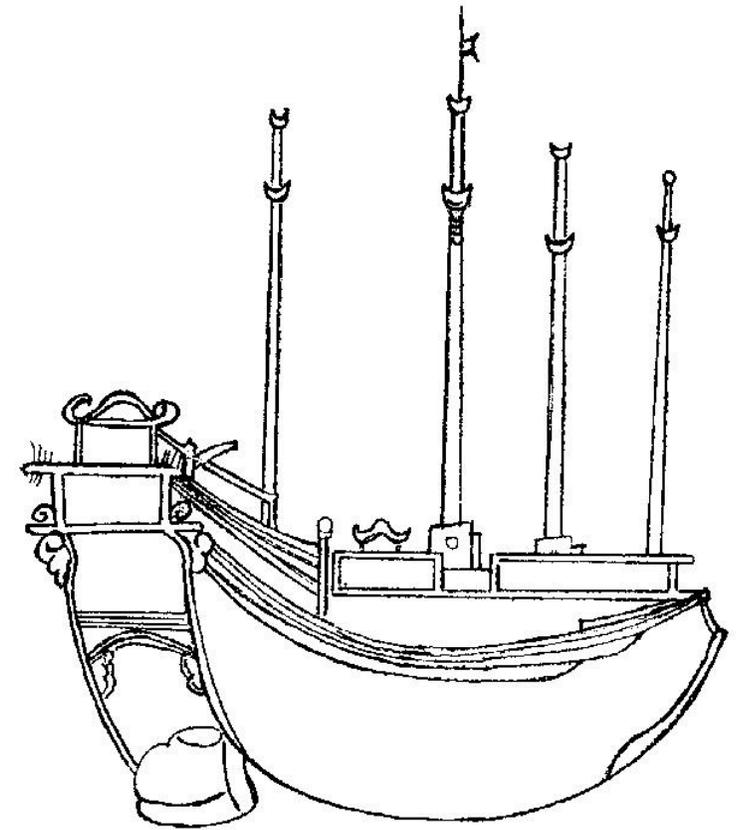


Grand Canal System



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Ming Treasure Voyages, 1405-1433

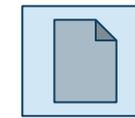


Chinese 4 Mast Junk
70 x 20 meters

Hanseatic League, C1400 CE



Port of Genoa, Late 15th Century



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Mercantilism and Colonialism

- The commercial revolution
 - The fifteenth century marked the beginning of an expansion of European hegemony throughout the world.
 - Europe became the core driver in the development of the global economy:
 - Two major phases.
 - 1. Mercantilism.
 - 2. Industrial revolution.
- Over three centuries (1500-1800):
 - The setting of capitalistic systems.
 - Limits of the world were pushed away.
 - A world where borders are drawn; a delimited world.
 - Establishment of vast colonial empires.
 - Setting of long-distance trade and communication networks.
 - Waves of innovations and socio-economic transformations.

The Setting of Market Economies (Commercial Revolution)

- Private property
 - Right to keep the outcomes of one's work.
 - Protection against unilateral confiscation.
- Banking
 - Accumulation of capital.
 - Protecting savings.
 - Availability of loans for ventures.
- Joint stock companies
 - Pooling resources from multiple investors.
 - Limited personal liability.
- Insurance
 - Mitigating risks.
- Contracts
 - Legally binding transactions.
- Associations and guilds
 - Diffusion of technical knowledge.
 - Organization of labor.

The Pillars of Mercantilism



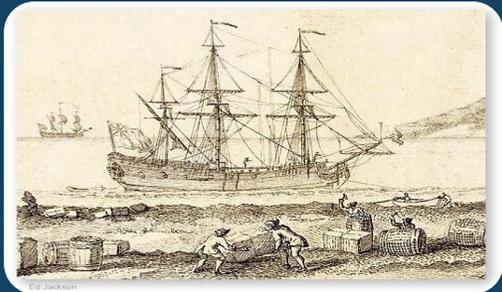
Nation-State

- Treaty of Westphalia (1648); temporal authority of the state.
- Promotion of national wealth and power.
- Wealth measured by the amount of bullion (gold or silver).
- Projection of national sea power to control foreign markets.



Unequal Trade

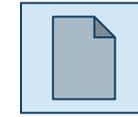
- Rise of merchants, markets and fairs.
- Encourage domestic production and exports, discourage imports.
- Discovery and setting of new markets through colonization.
- Setting of the first multinational corporations.
- Positive trade balance with other countries under control (zero sum game).



Techniques

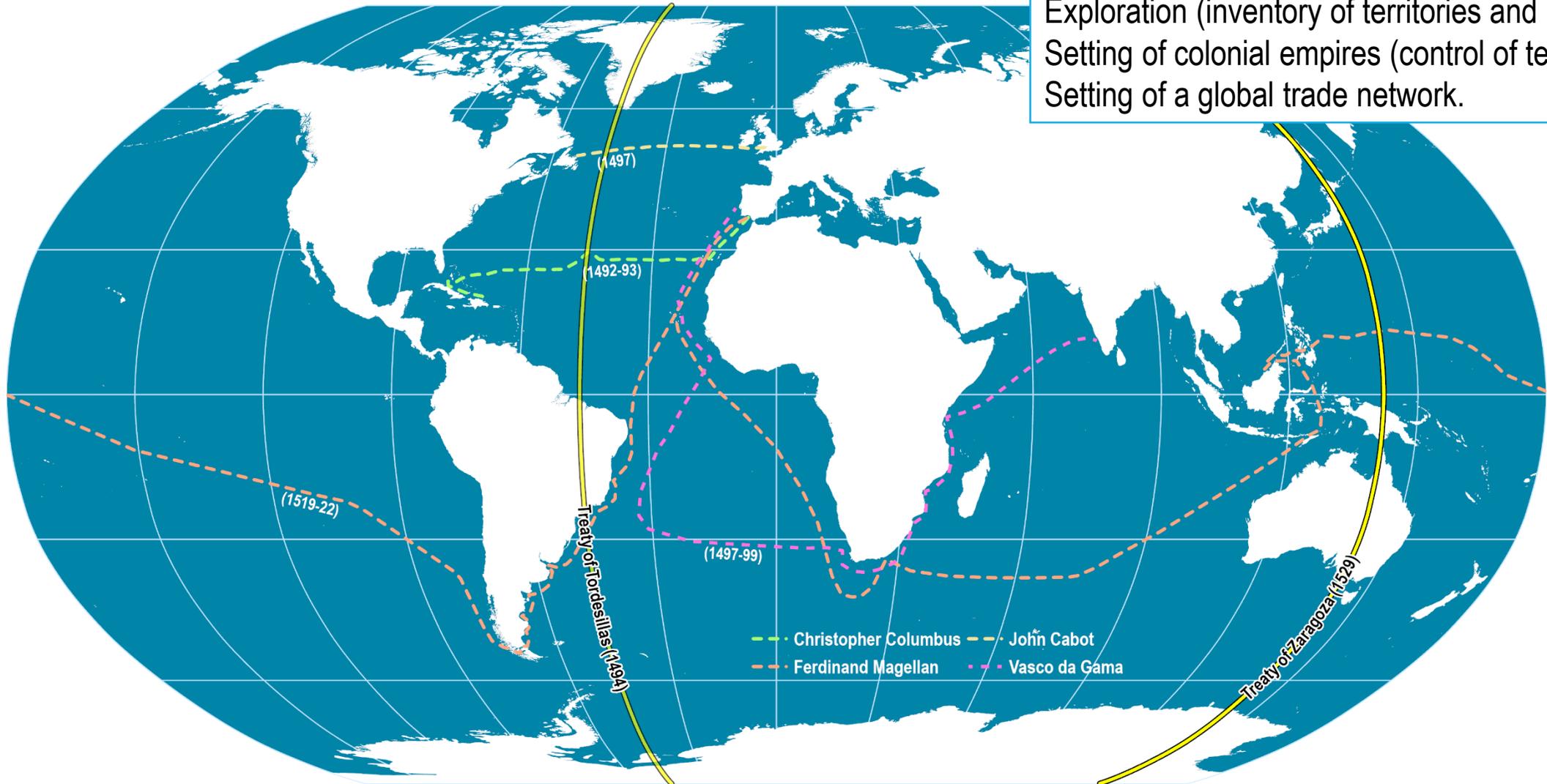
- Gunpowder and artillery.
- Improvements in navigation, maritime shipping and transport.
- Moveable type (mass production and marketing of books).
- Mechanical clocks, instruments, increased skills of craftsmen.

Early European Maritime Expeditions, 1492-1522

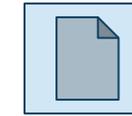


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Exploration (inventory of territories and resources).
Setting of colonial empires (control of territories).
Setting of a global trade network.



Spanish and Portuguese Empires (1581-1640)



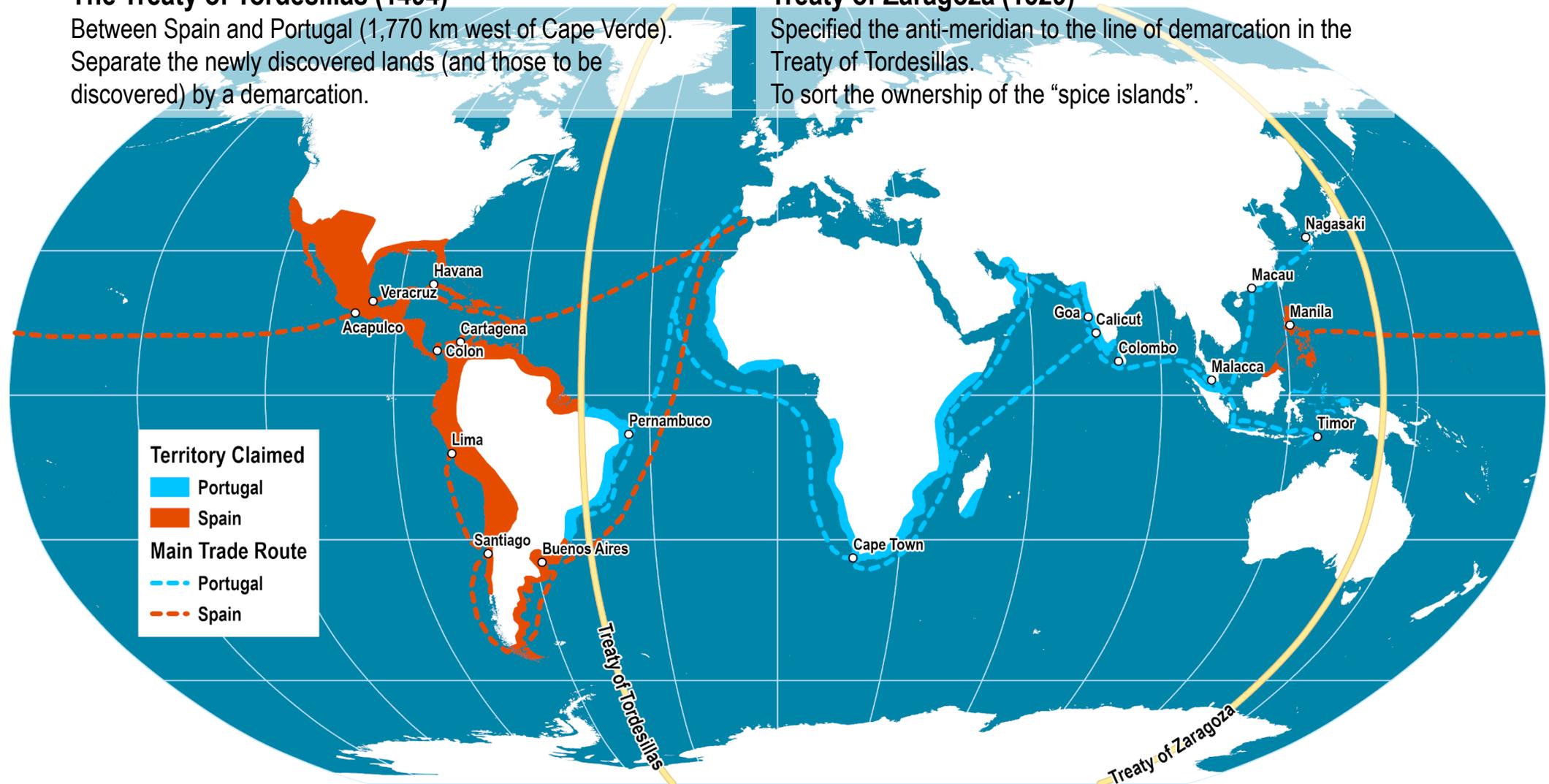
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The Treaty of Tordesillas (1494)

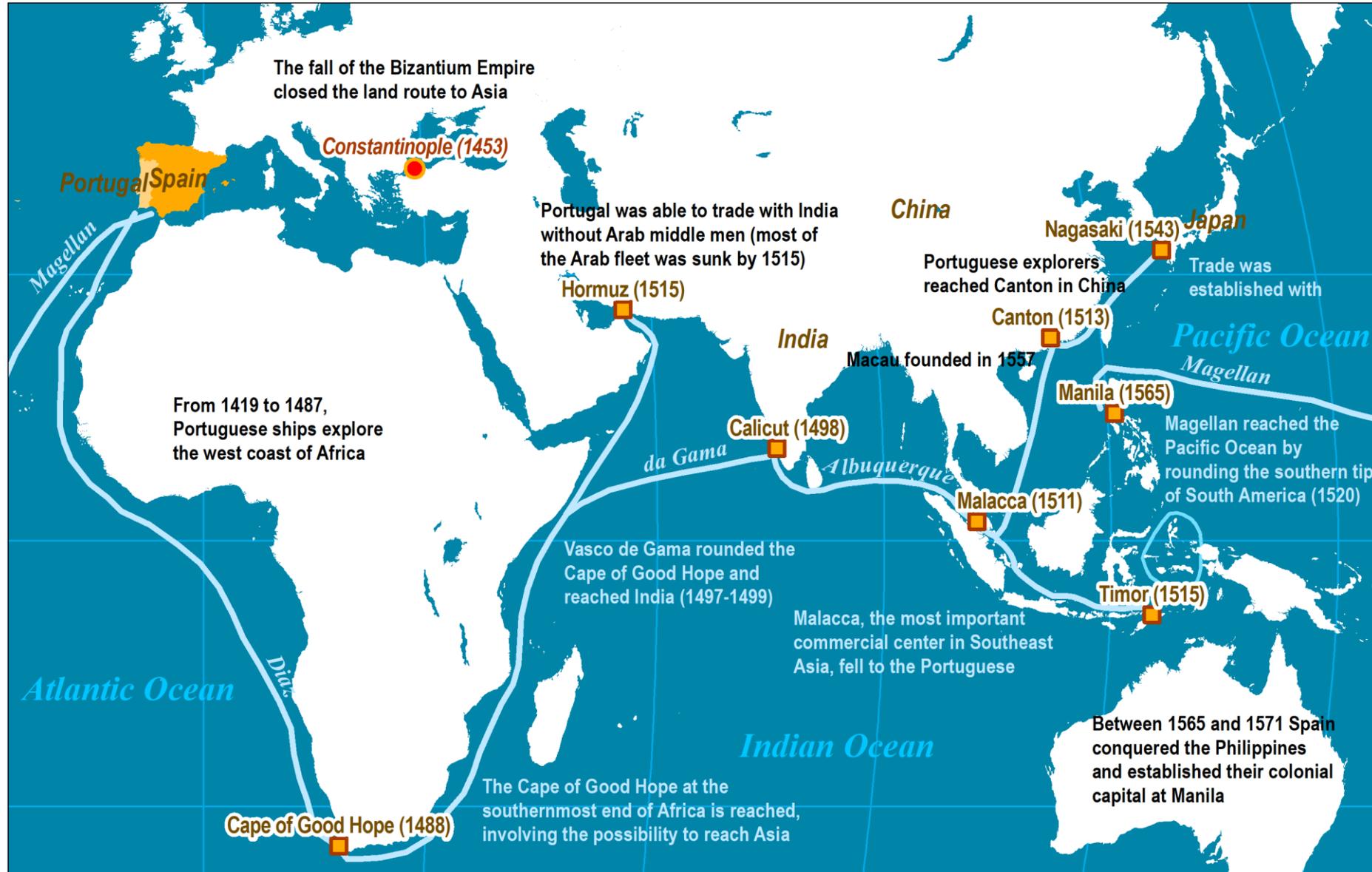
Between Spain and Portugal (1,770 km west of Cape Verde).
Separate the newly discovered lands (and those to be discovered) by a demarcation.

Treaty of Zaragoza (1529)

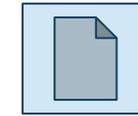
Specified the anti-meridian to the line of demarcation in the Treaty of Tordesillas.
To sort the ownership of the "spice islands".



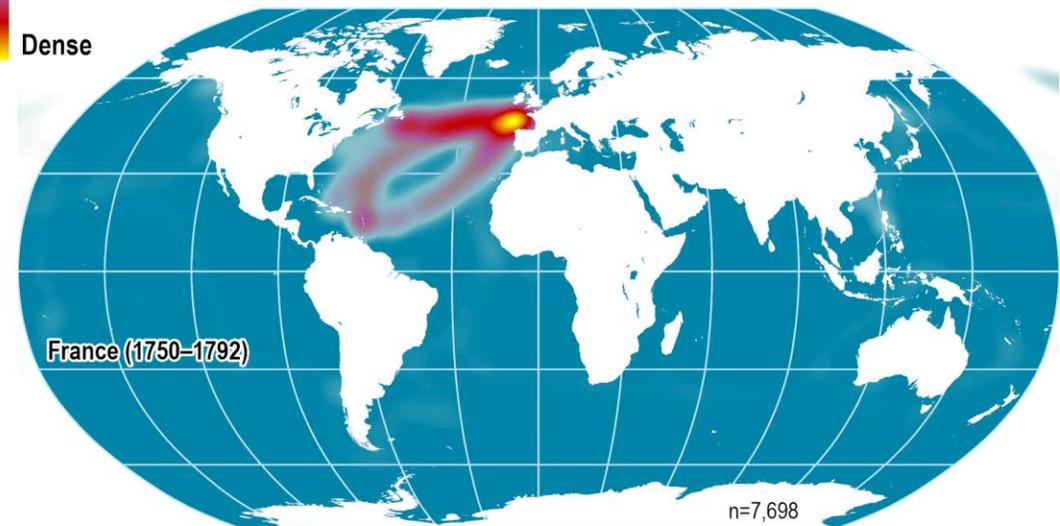
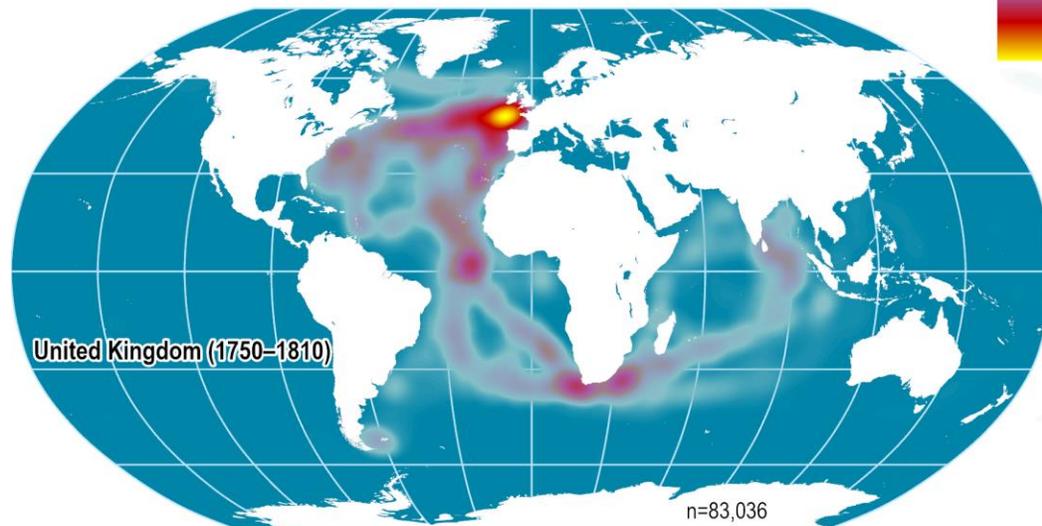
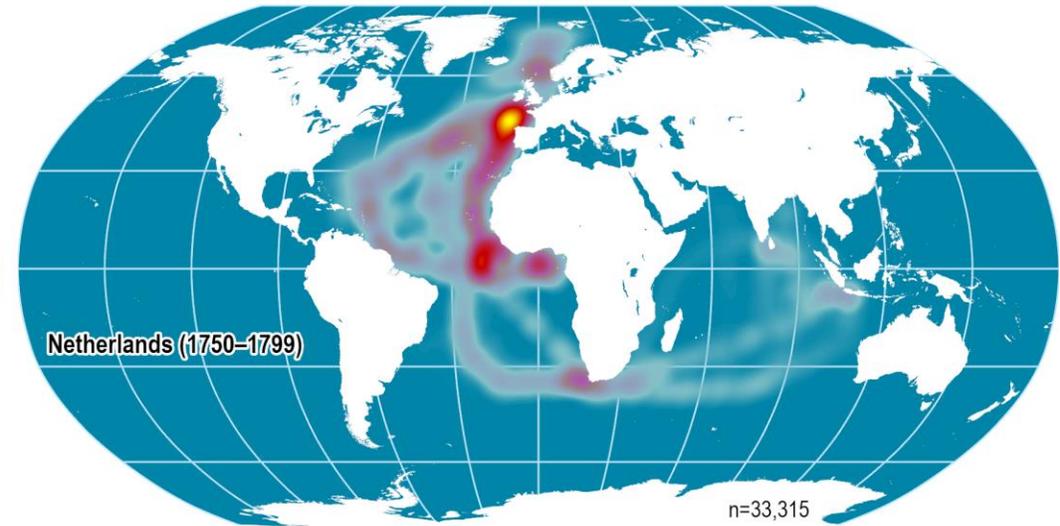
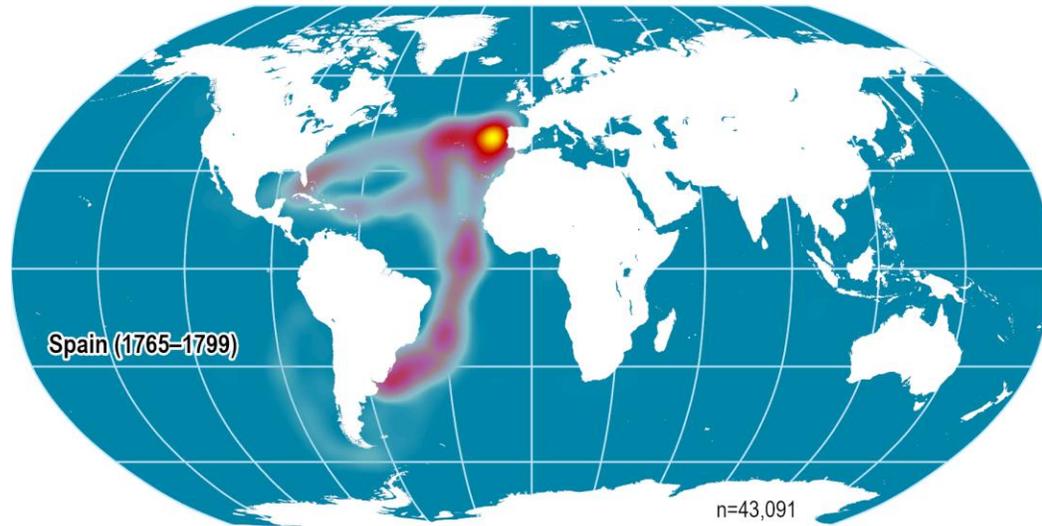
The Eastern and Western Maritime Routes to Asia



Density of Ship Log Entries, 1750-1810



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Mercantilism and Colonialism

- Colonialism

- Economic incentives:

- Search for raw materials ('colonial' commodities; tea, coffee, sugar, cocoa, minerals).
 - Expansion of national market into monopolistic areas.
 - New territories for capital investments in infrastructure (ports, railways, roads).
 - Territories for European migration.

- Political and strategic factors:

- National prestige and manifest destiny.
 - Control of strategic locations (Suez, Malacca, Gibraltar, Malta, Hong Kong).

- Cultural:

- The drive for discovery (territories, biology).
 - Spread of religion and culture.

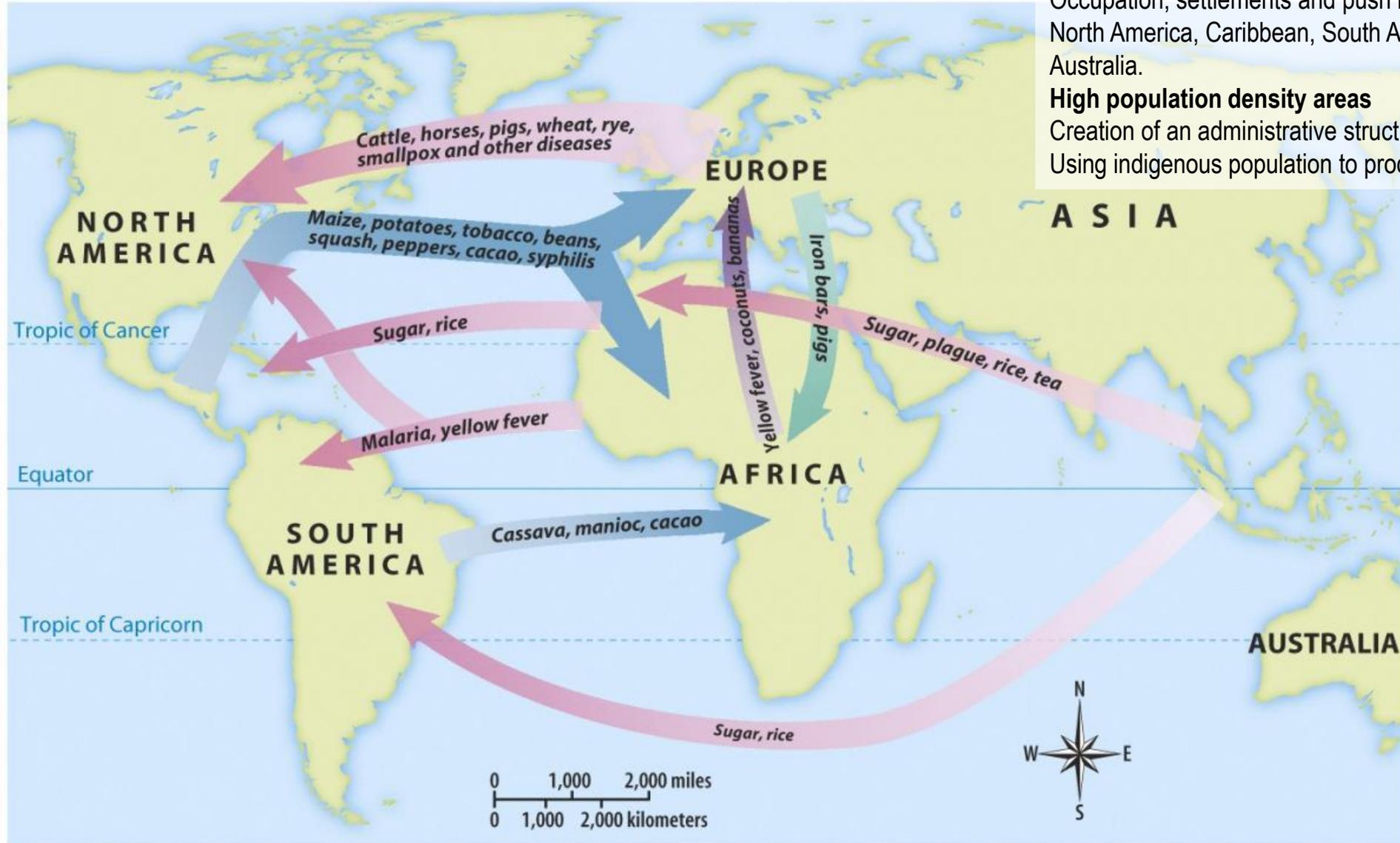
- Technological factors:

- Scientific advantages.
 - Military superiority (maritime power).

Mercantilism and Colonialism

- Trade (commercial revolution)
 - Changes in the nature of trade:
 - More than 90% of the population was agricultural.
 - Growing consideration of the “mass market”.
 - Luxury goods were no longer the bulk of what was being exchanged (spices, silk, etc.).
 - “Consumer goods” such as grain, wine, salt, wool, cloths and metals.
 - European control of global trade:
 - From intermediaries (e.g. Venice, Arabs) to direct involvement.
 - Setting of militarized trade networks; control of the “global supply chain”.
 - Transformation of foreign societies (colonialism, plantations, new products).
 - The setting of a core (colonial nations) and a periphery (colonies).

The “Colombian Exchange”



Low population density areas

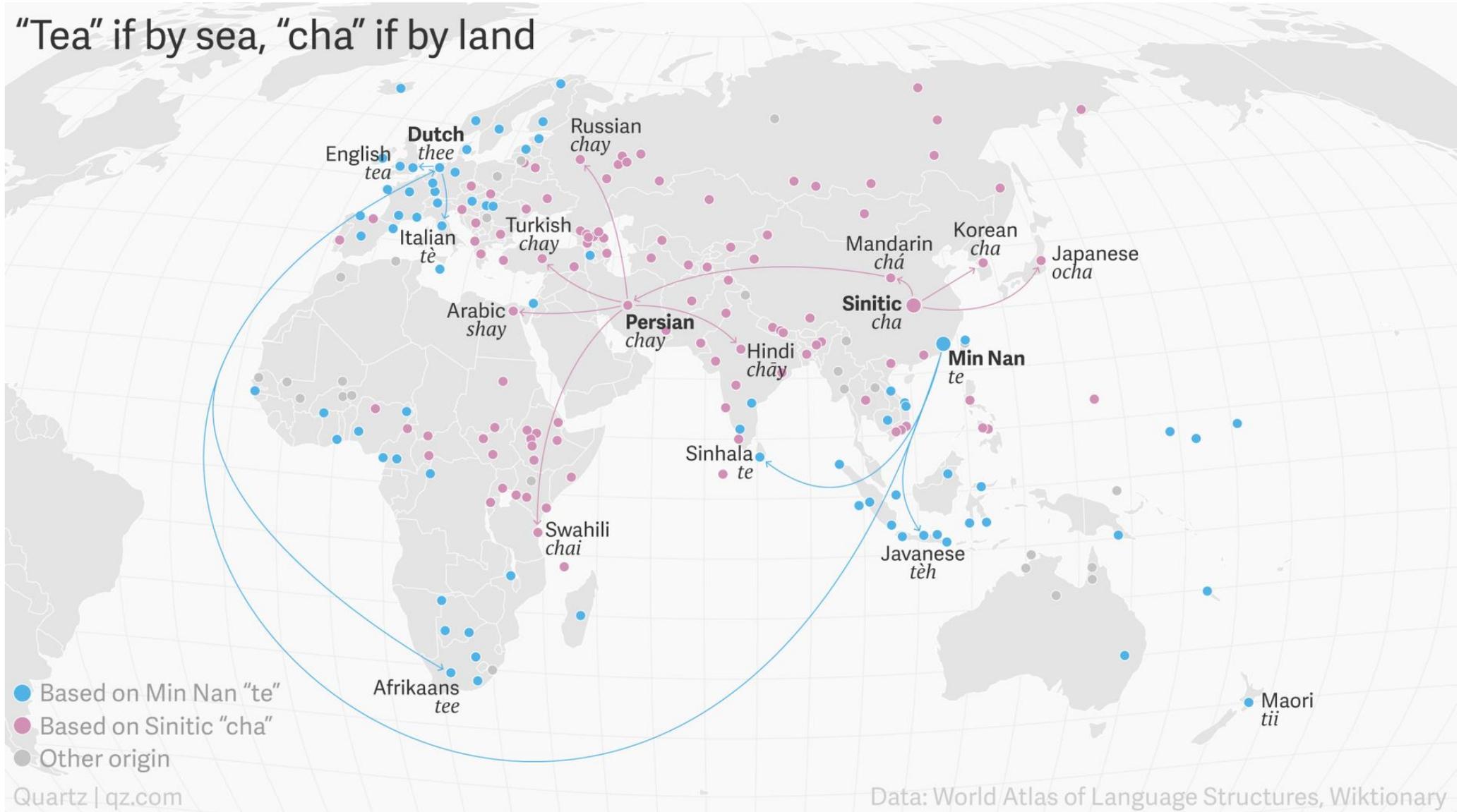
Occupation, settlements and push back of native populations.
North America, Caribbean, South America, South Africa, Australia.

High population density areas

Creation of an administrative structure.
Using indigenous population to produce primary goods.

Geo-linguistic Map of Tea

"Tea" if by sea, "cha" if by land



The Performance of Pre-industrial Means of Transportation

Walking



 40 lbs / 18 kg

 5 km/hr

 30 km/day

Horse Riding



 275 lbs / 125 kg

 8 km/hr

 60 km/day

Camel



 350 lbs / 160 kg

 5 km/hr

 40 km/day

Horse & cart



 1 ton

 3 km/hr

 25 km/day

Barge pulled by horse

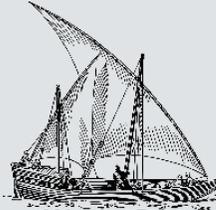


 50-100 tons

 4 km/hr

 35 km/day © GTS

Dhow

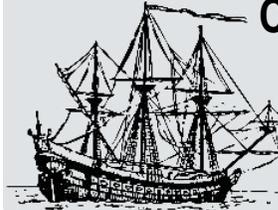


 15-300 tons

 13 km/hr

 150 km/day

Carrack (15th century)



 500-1500 tons

 10 km/hr

 130 km/day

Galleon (17th century)



 500-800 tons

 15 km/hr

 300 km/day

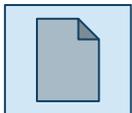
Clipper (19th century)



 500-1500 tons

 30 km/hr

 700 km/day



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The Industrial Revolution

- Nature

- Started at the end of the eighteenth century (1750-1780).
- Economic and social transformations first observed in England.
- Demographic transition of the population:
 - Fast growth rate of the European population.
 - Improvements in sanitary conditions and hygiene.

- The Great Divergence

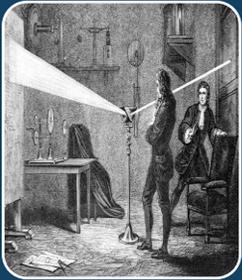
- The Industrial Revolution radically changed the foundations of economic systems.
- Most of the technical innovations that modified the way to produce and transport took place in a short period, mainly between 1760 and 1800.
- Growth in the differences between European and non-European societies.

The European Origins of the Industrial Revolution



Competition

- Political fragmentation (monarchies and republics).
- Divided into competing corporate entities (early multinationals).



The Scientific Revolution

- 17th century breakthroughs in mathematics, astronomy, physics, chemistry and biology.
- The scientific method.



The Rule of Law and Representative Government

- The sovereignty of the individual.
- Private property rights.
- Representation of property owners in elected legislatures.



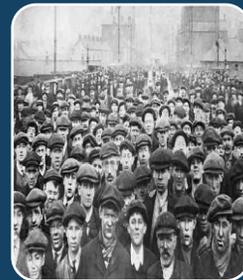
Modern Medicine

- Breakthroughs in health care (19th and 20th centuries).
- Decline in death rates and increase in life expectancy.



Consumer Society

- Supply of productivity-enhancing technologies.
- Demand for more, better, and cheaper goods.



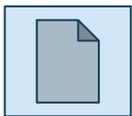
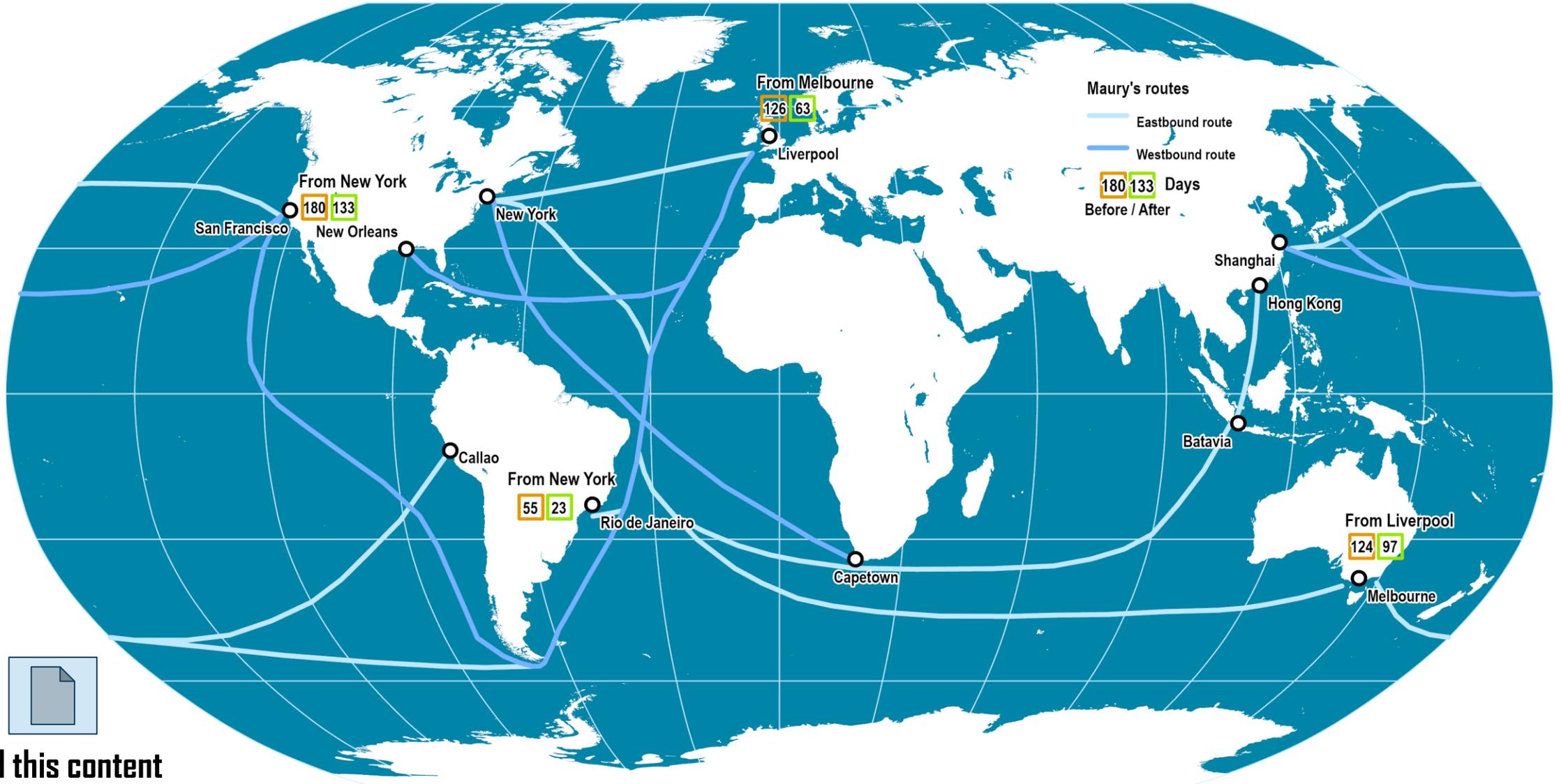
Work Ethic

- Combine more extensive and intensive use of labor.
- Hard work, punctuality, frugality.
- Higher savings rates; sustained capital accumulation.

The Modern Era

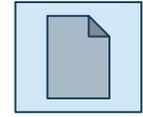
- Technological innovations
 - New methods of production:
 - New materials (steel, iron, chemicals).
 - Substitution of machines to human and animal labor.
 - Usage of thermal energy to produce mechanical energy.
 - Changes in the nature production and consumption:
 - Increased productivity within a factory system of production.
 - Division of labor.
 - New industrial locations (initially waterfalls and then coal fields).
 - Main sectors of innovation:
 - Power generation.
 - Textiles.
 - Metallurgy.
 - Transportation.

Impacts of Maury's Navigation Charts on Sailing Time, 1850s

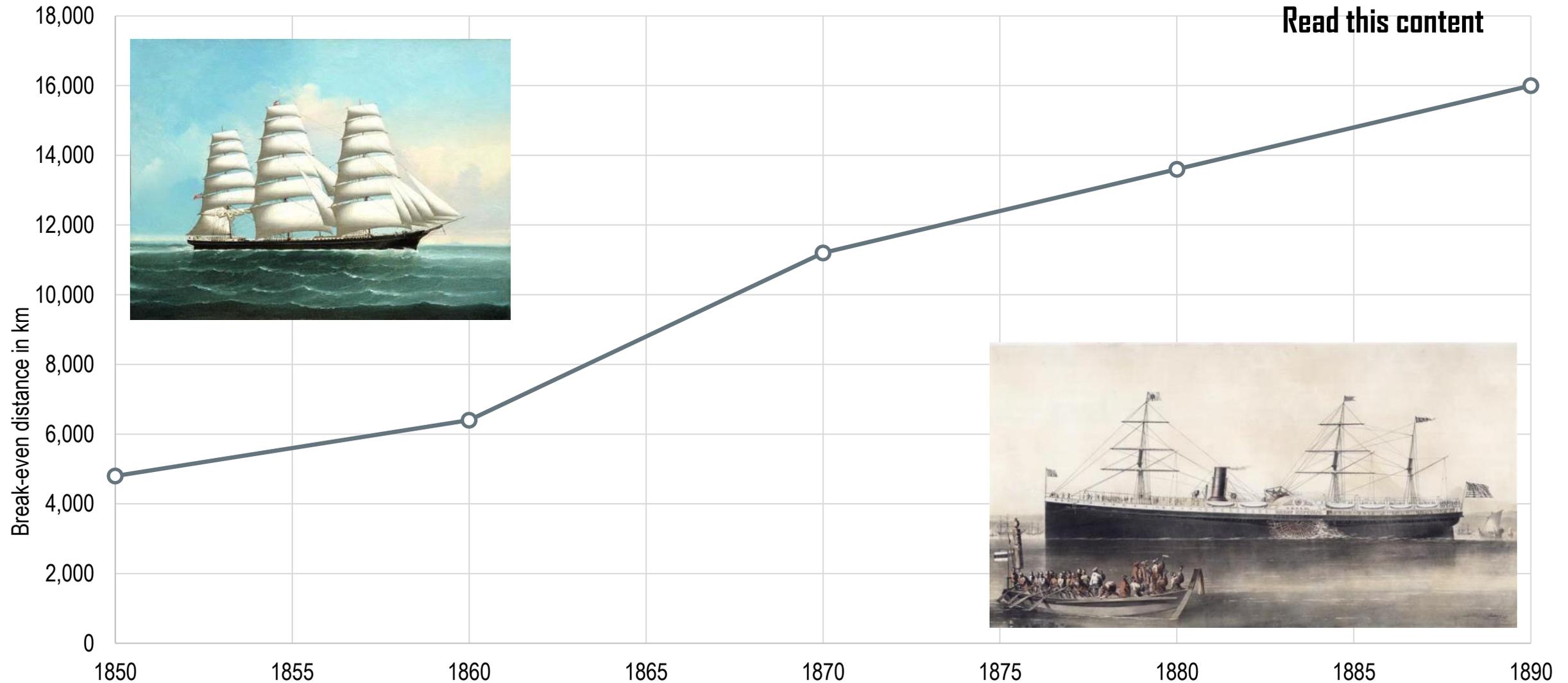


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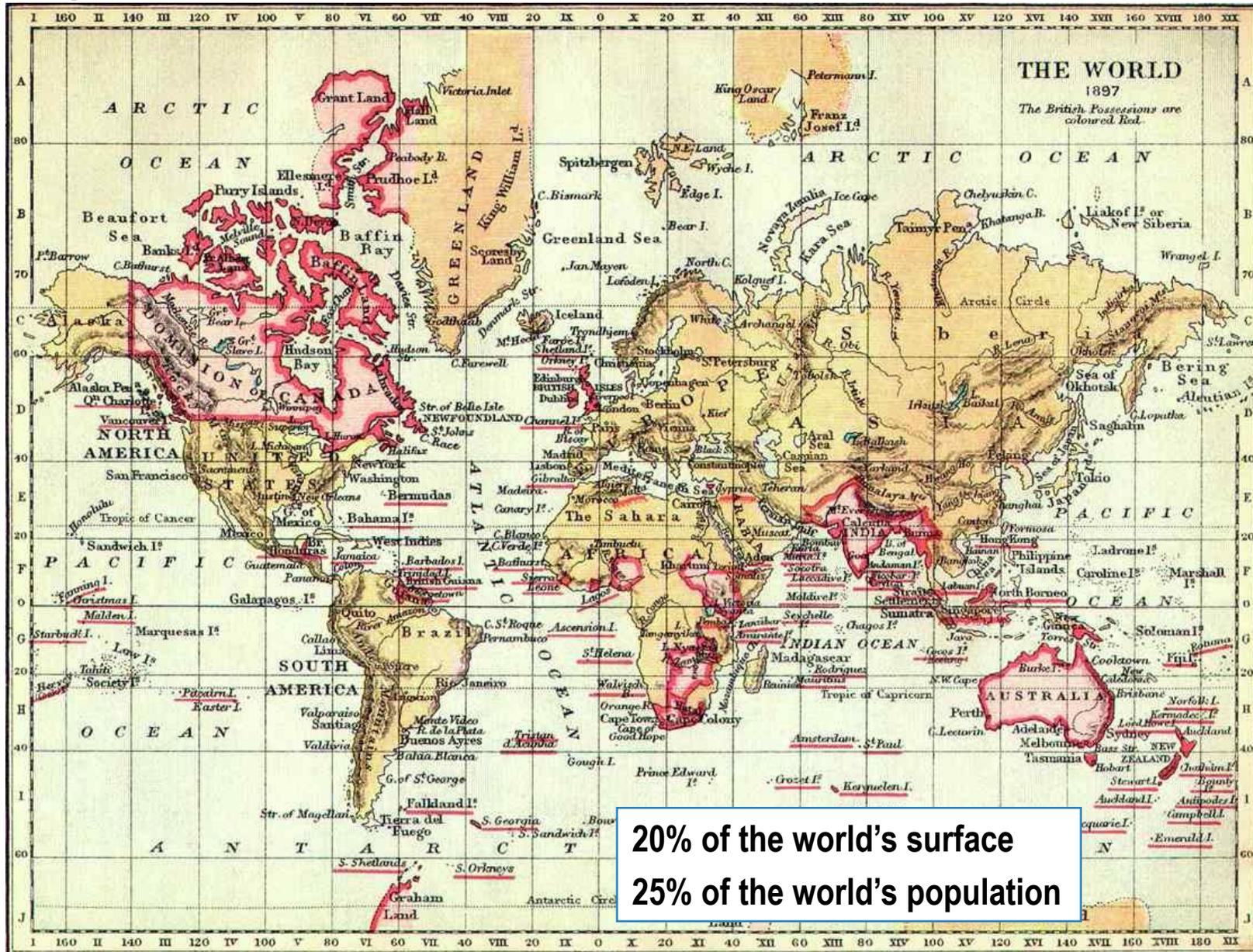
Break-Even Distance between Sail and Steam, 1850-1890



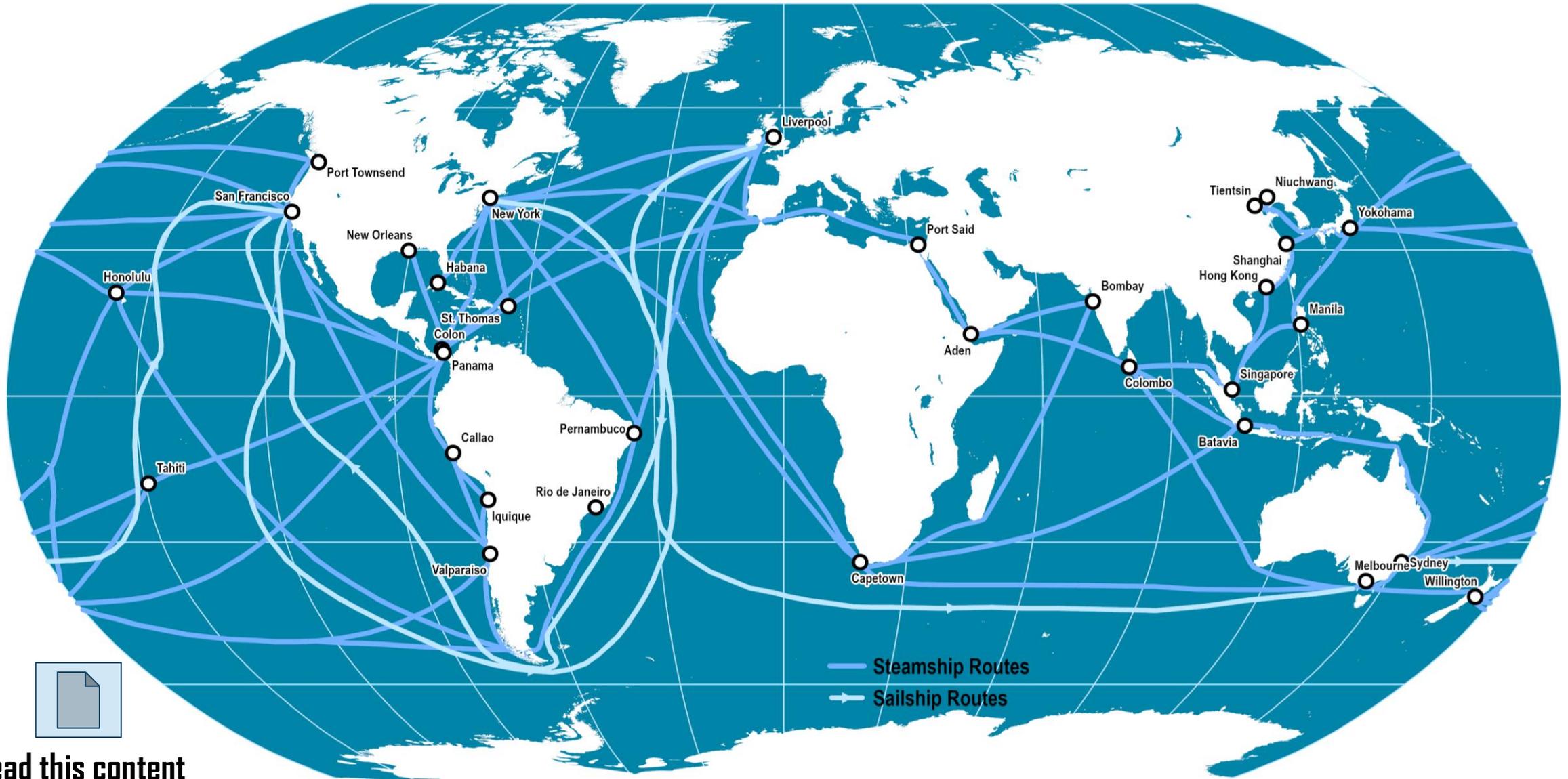
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The British Empire, 1897

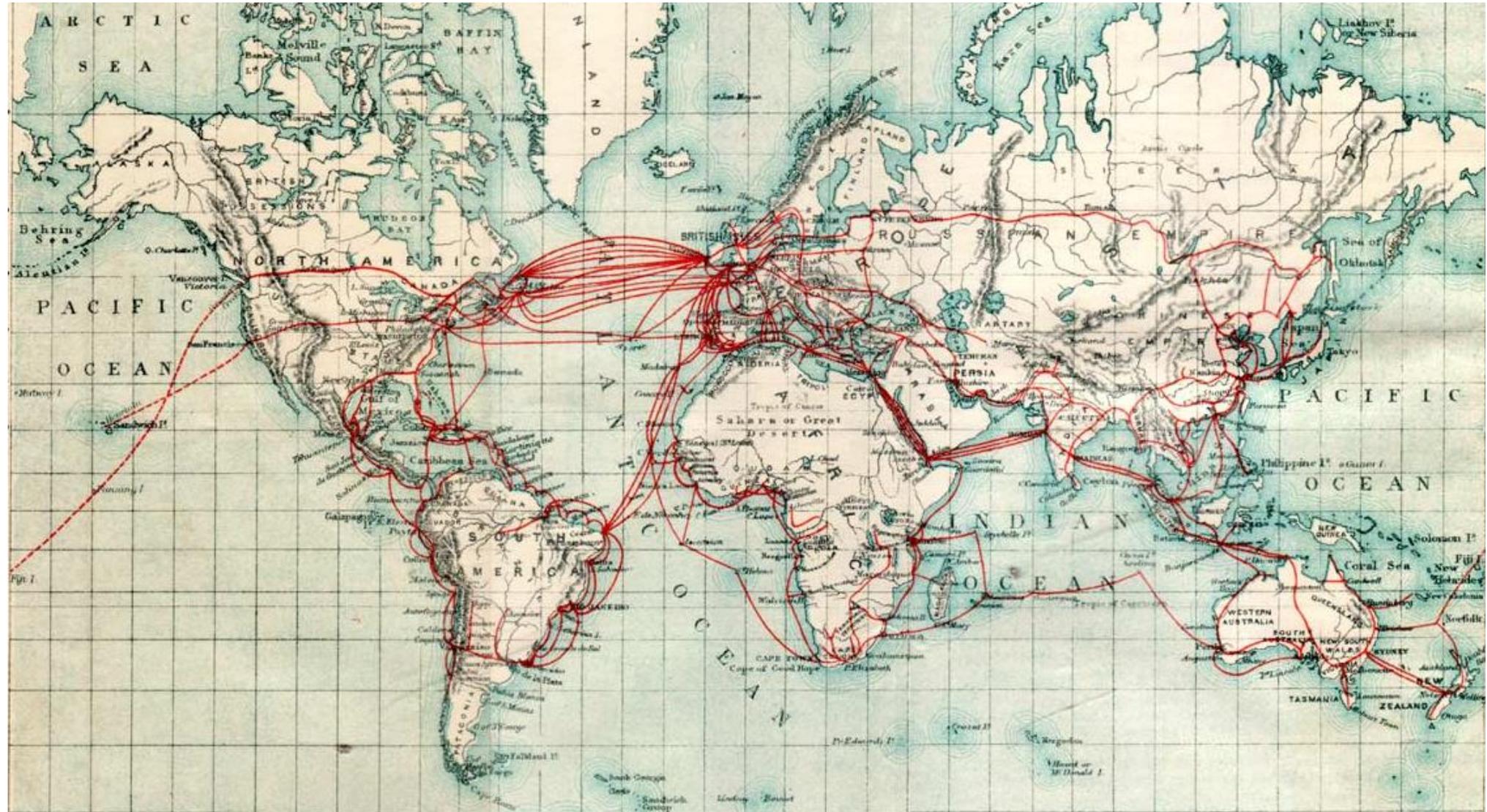


World Maritime Trade Routes, 1912

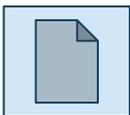
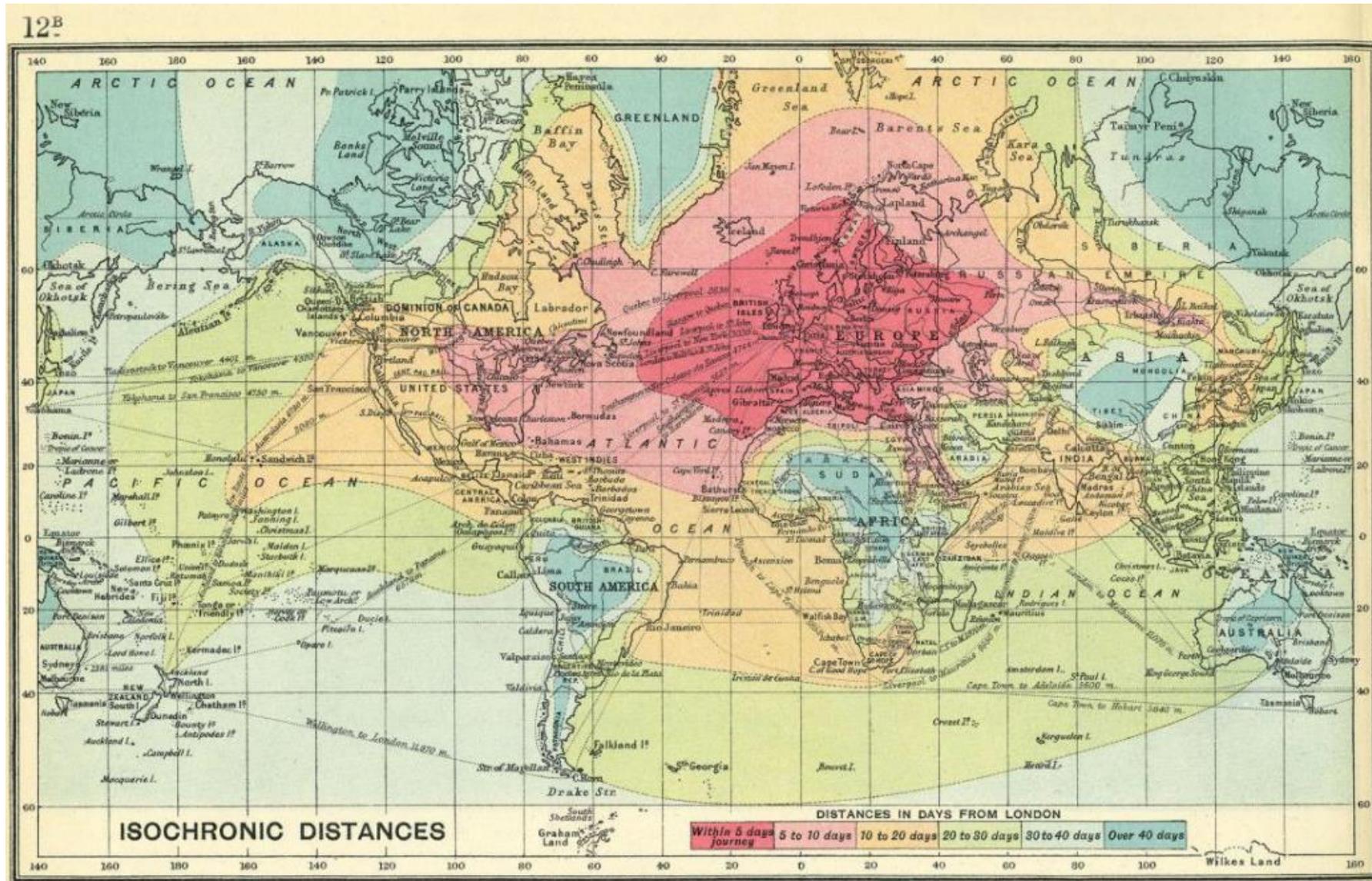


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Global Telegraph System, c1901 (the Victorian Internet)

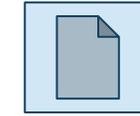


Travel Time between London and the Rest of the World, 1914

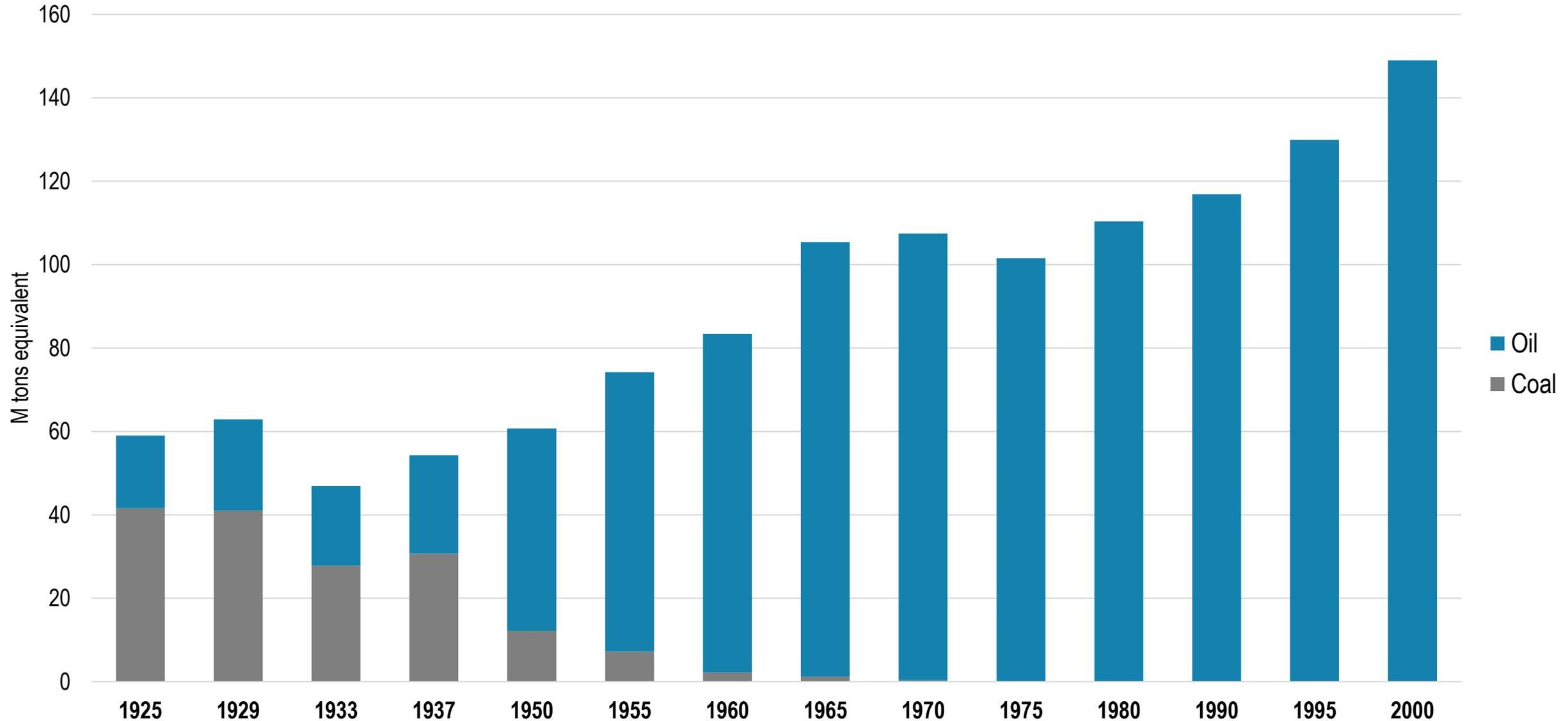


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Marine Sales of International Marine Bunkers, 1925-2000



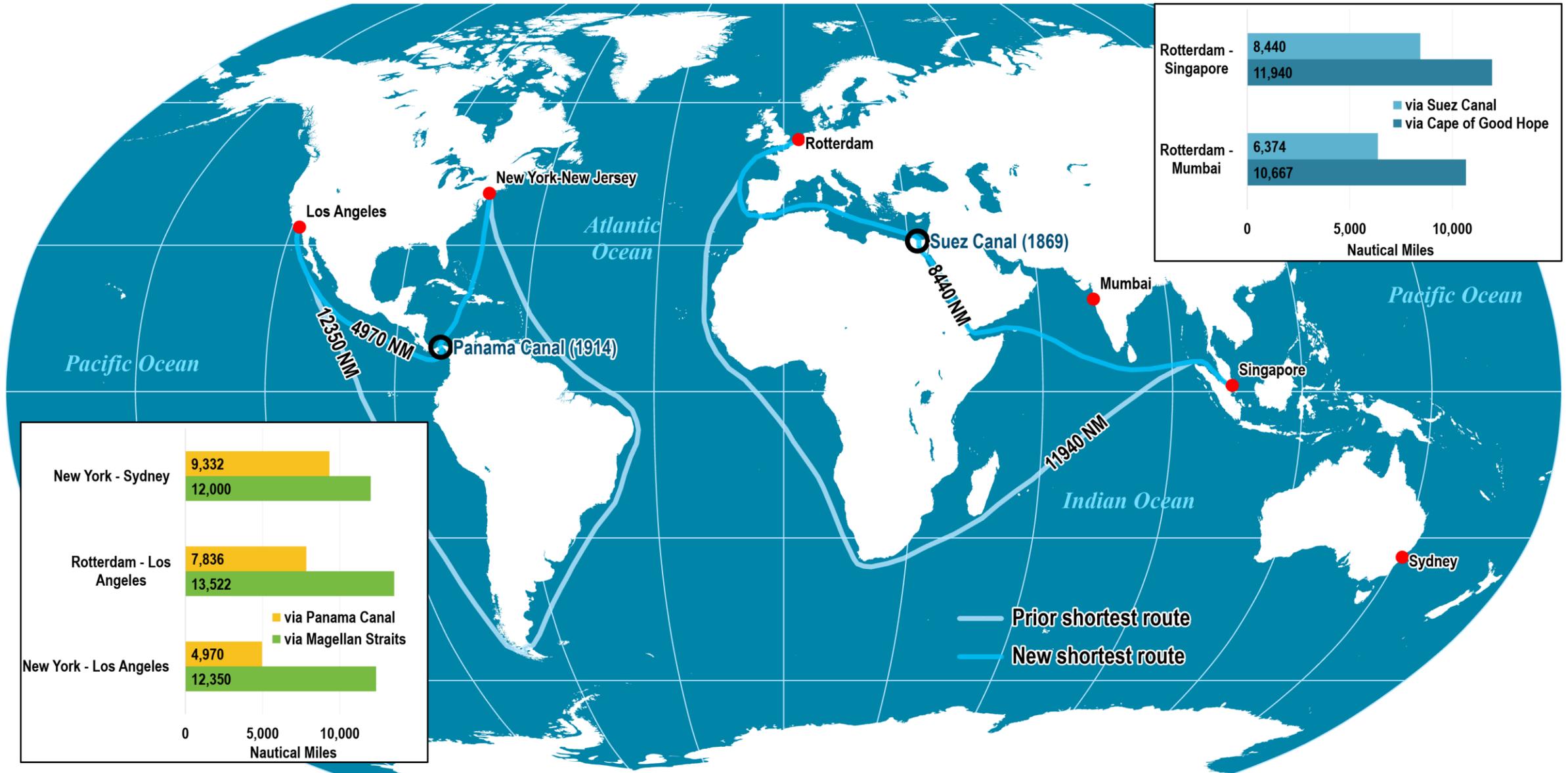
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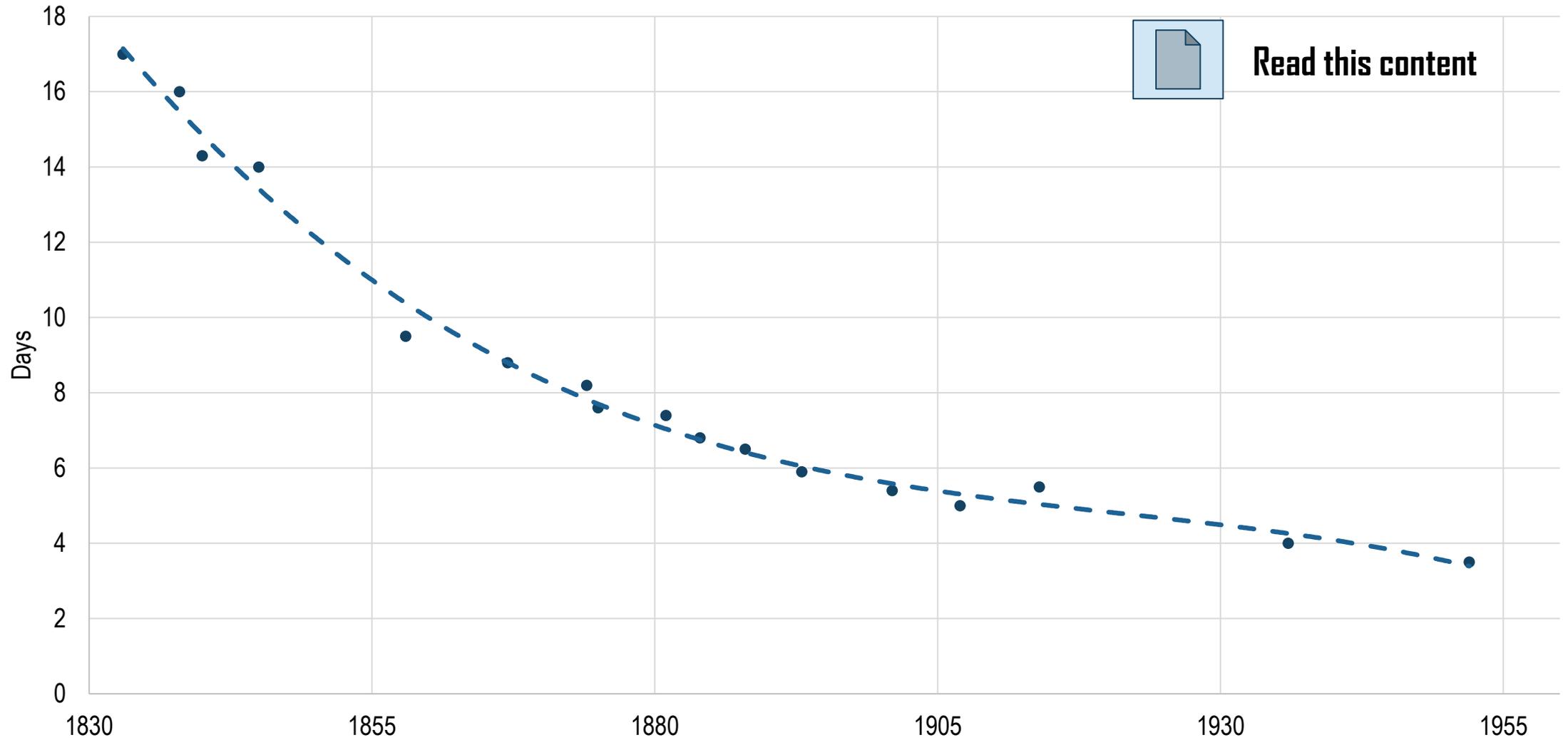
Geographical Impacts of the Suez and Panama Canals



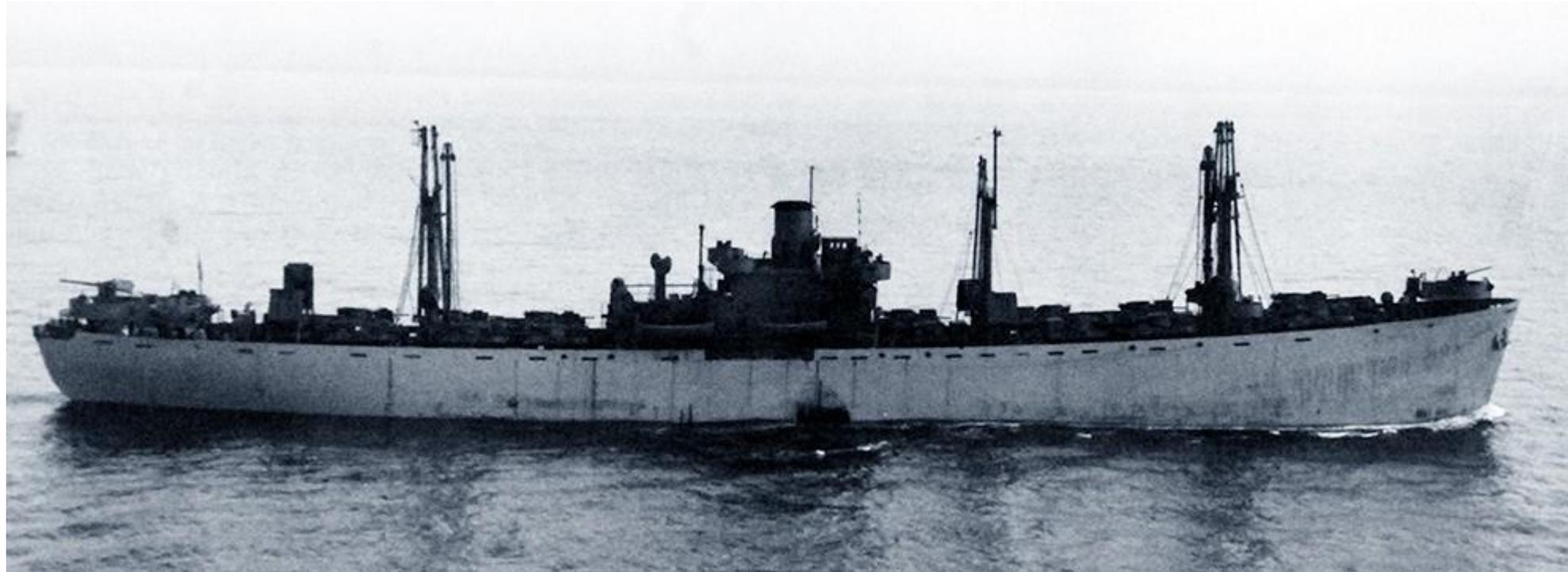
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Liner Transatlantic Crossing Times, 1833 – 1952 (in days)

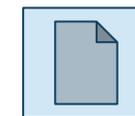
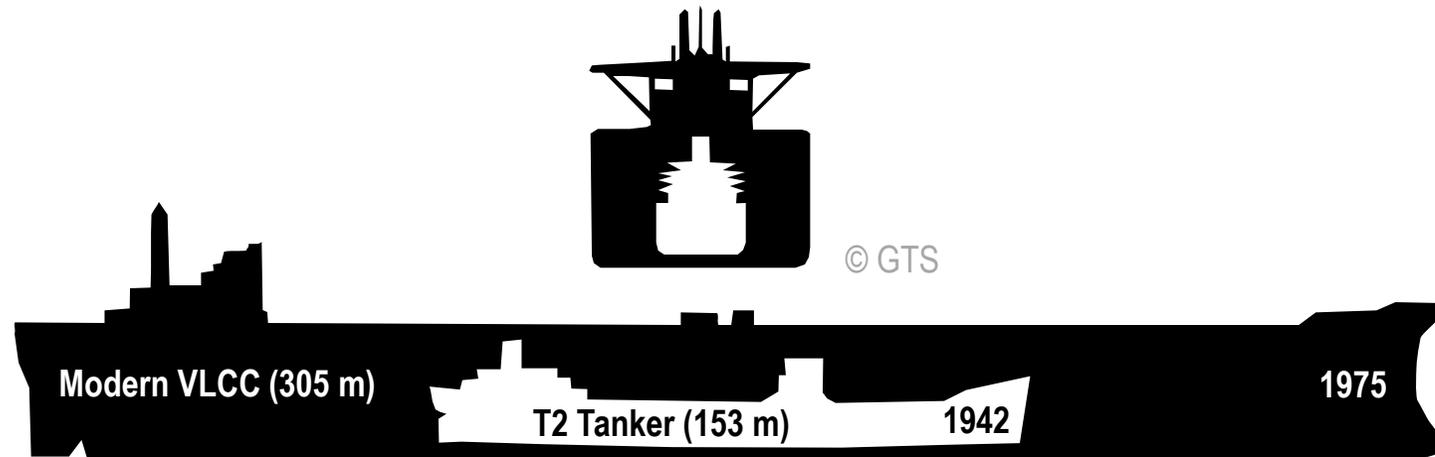


Liberty Ship SS Caesar Rodney, 1944



135 x 17 meters
10,800 DWT

Comparison between a Contemporary and Second World War Tanker



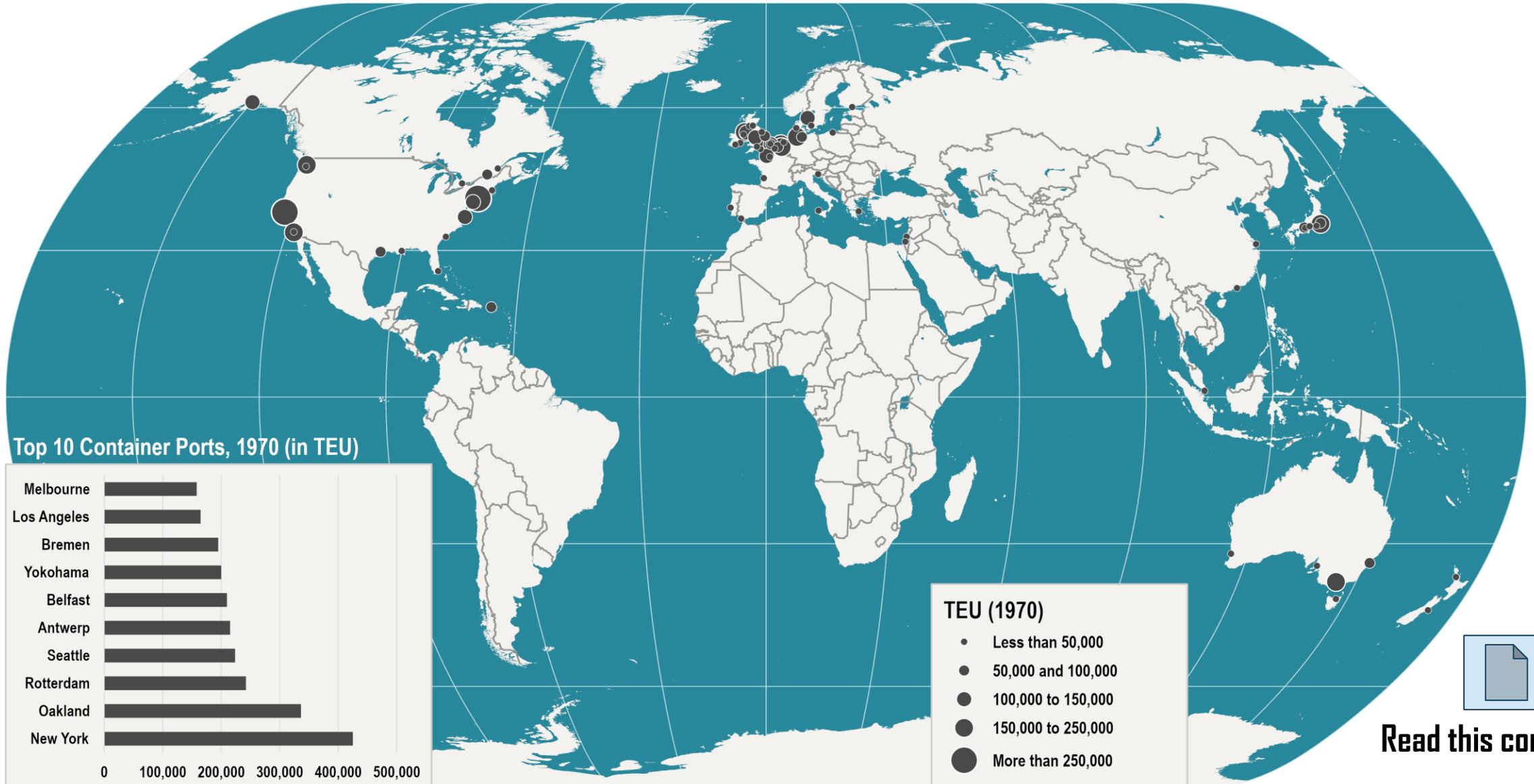
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ACT 1 (Associated Container Transport), 1970

One of the first purpose-built containership
217 meters LOA
1,130 TEU

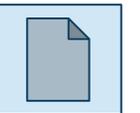
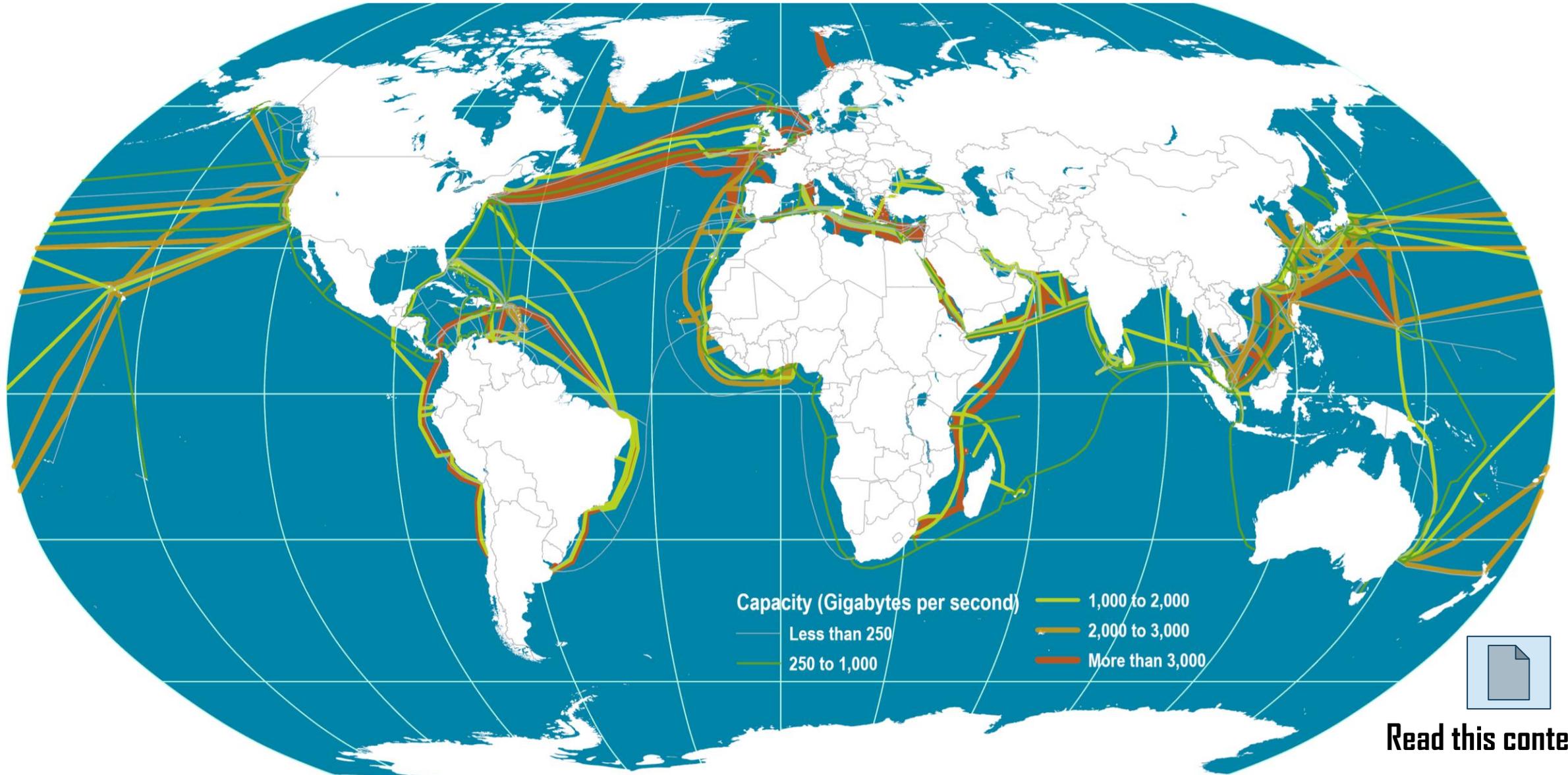


The Dawn of Containerization: 1970



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Global Submarine Cable Network



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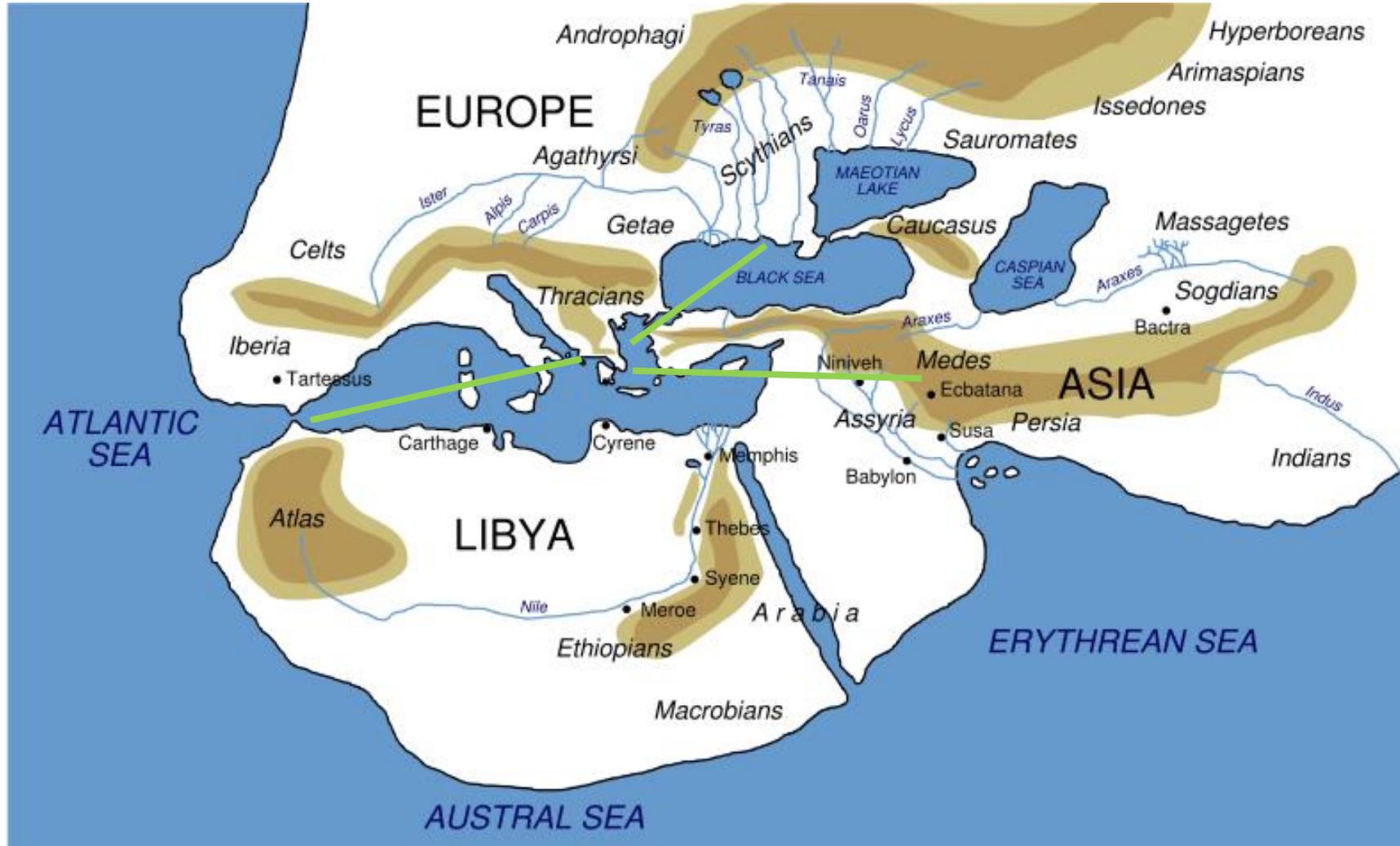
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INTRODUCTION TO THE MARITIME INDUSTRY

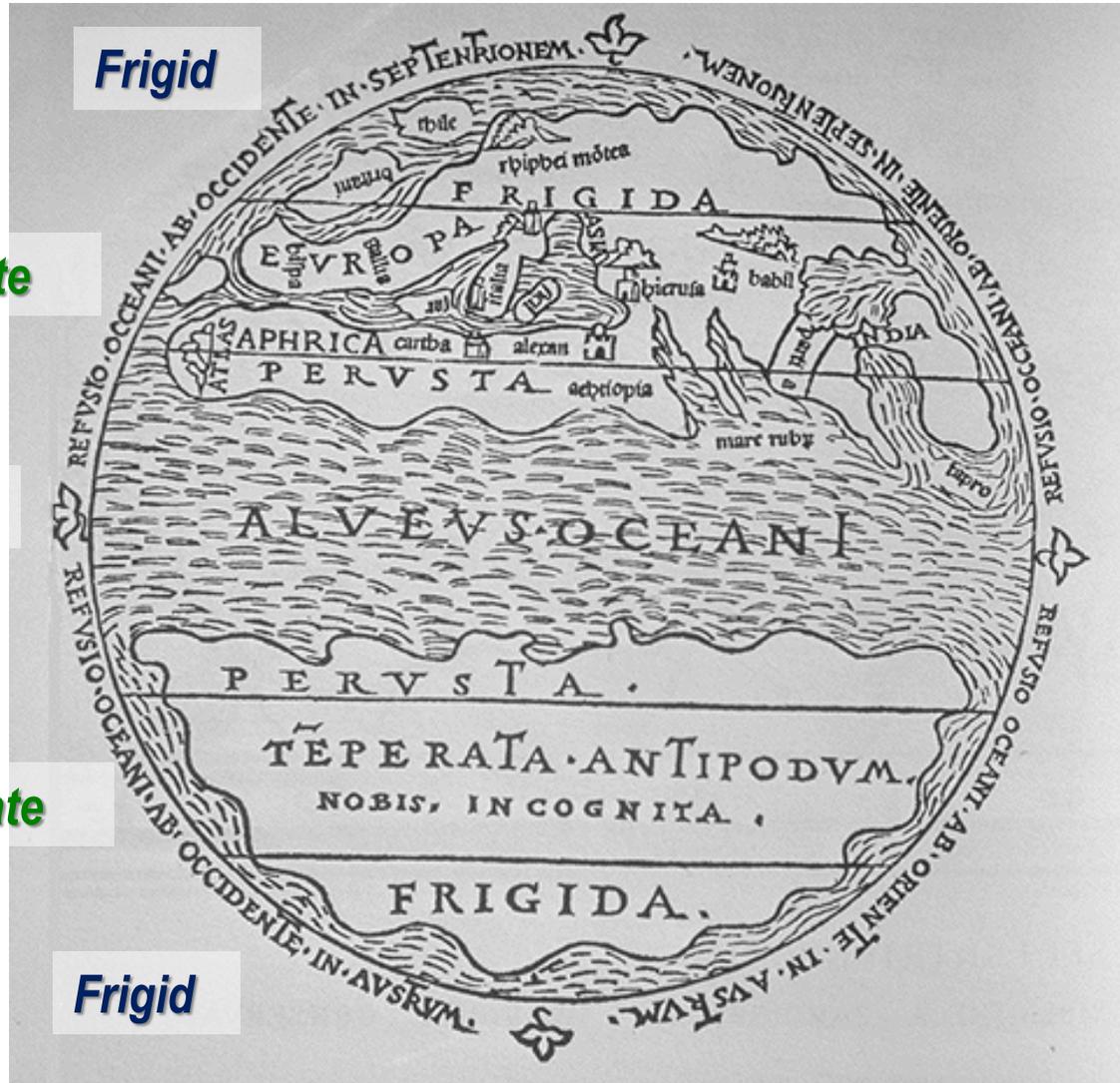


B. Geography of Maritime Shipping

Herodotus (450 BCE) (recreation)

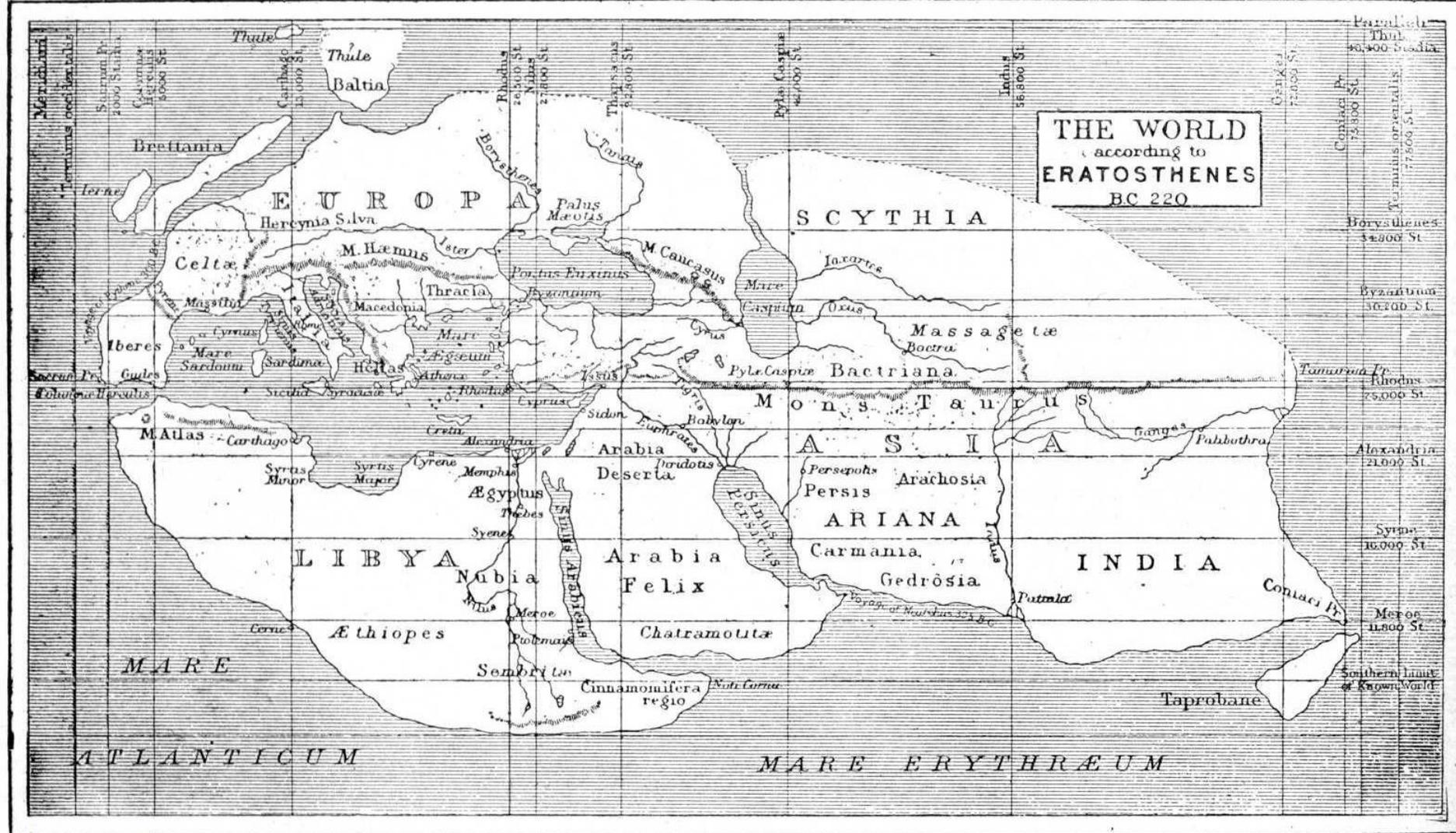


Aristotle (circa 350 BCE)



- Considered physical elements such as the temperature and winds as factors of the human habitat.
- Division of the world in 3 climatic zones.
- Relationships between the environment (temperature) and human habitat.
- One of the first physical geographers.
- Judged impossible to cross to torrid equatorial zone and reach the antipodes.

Eratosthenes (194 BCE) (reconstruction)



Formally assumed the earth was round: Calculated the circumference of the earth (40,572 km versus 40,091 km). Developed the concepts of parallel and meridian (geographical location). Created modern cartography (cartographic plane).

Ptolemy's (150 CE) Ulm edition world map, 1482



- Refined the coordinate system. Created map projections.
- Inventory of population and resources. Describing the world (8,000 entries).
- Relationships between the physical and human elements.
- His map would remain the most accurate until the age of discovery.

St. Sever World Map after Beatus, 1030 CE



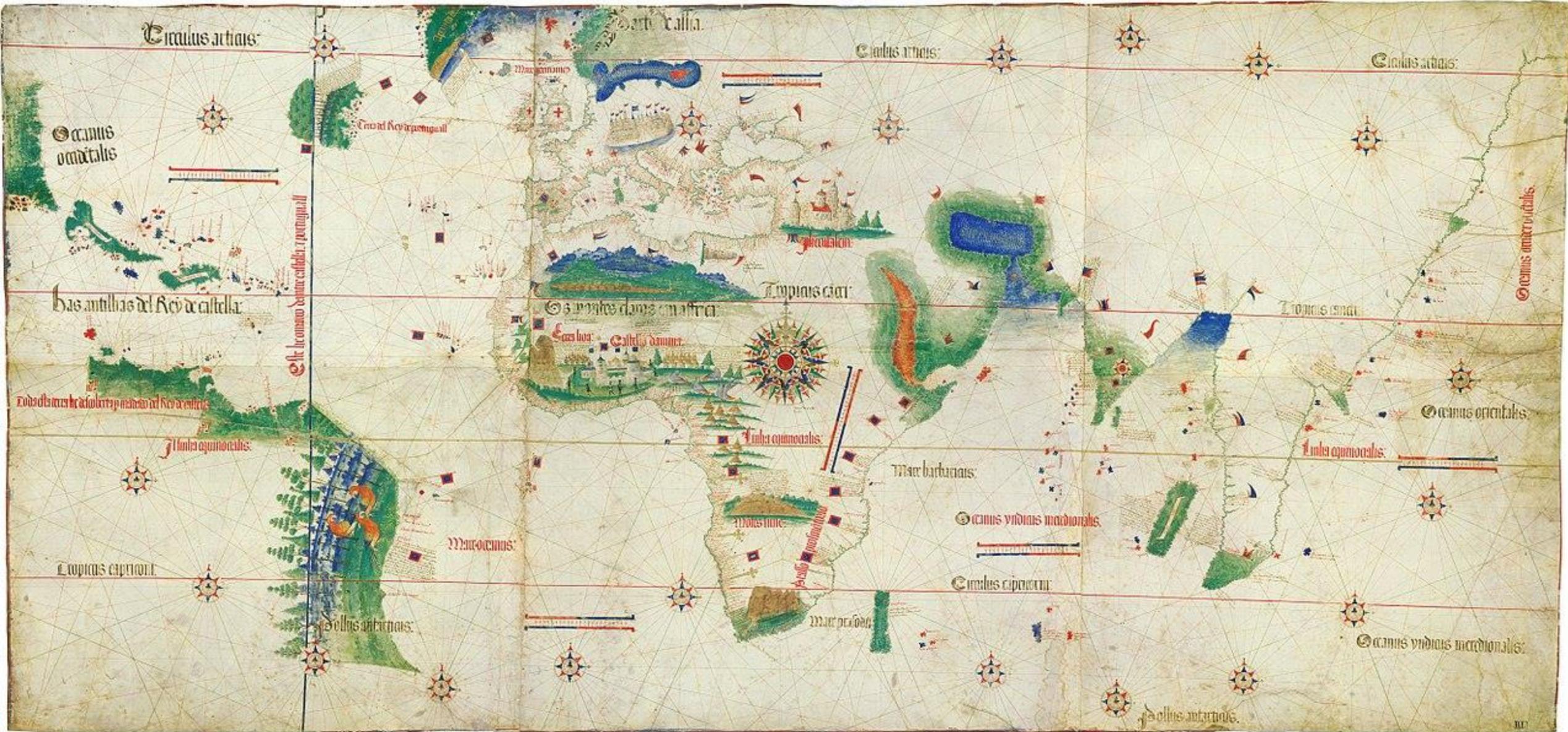
Tabula Rogeriana (Map of Roger); Muhammad al-Idrisi (1154)



Da Ming Hunyi Tu (Map of the Ming Empire), circa 1389



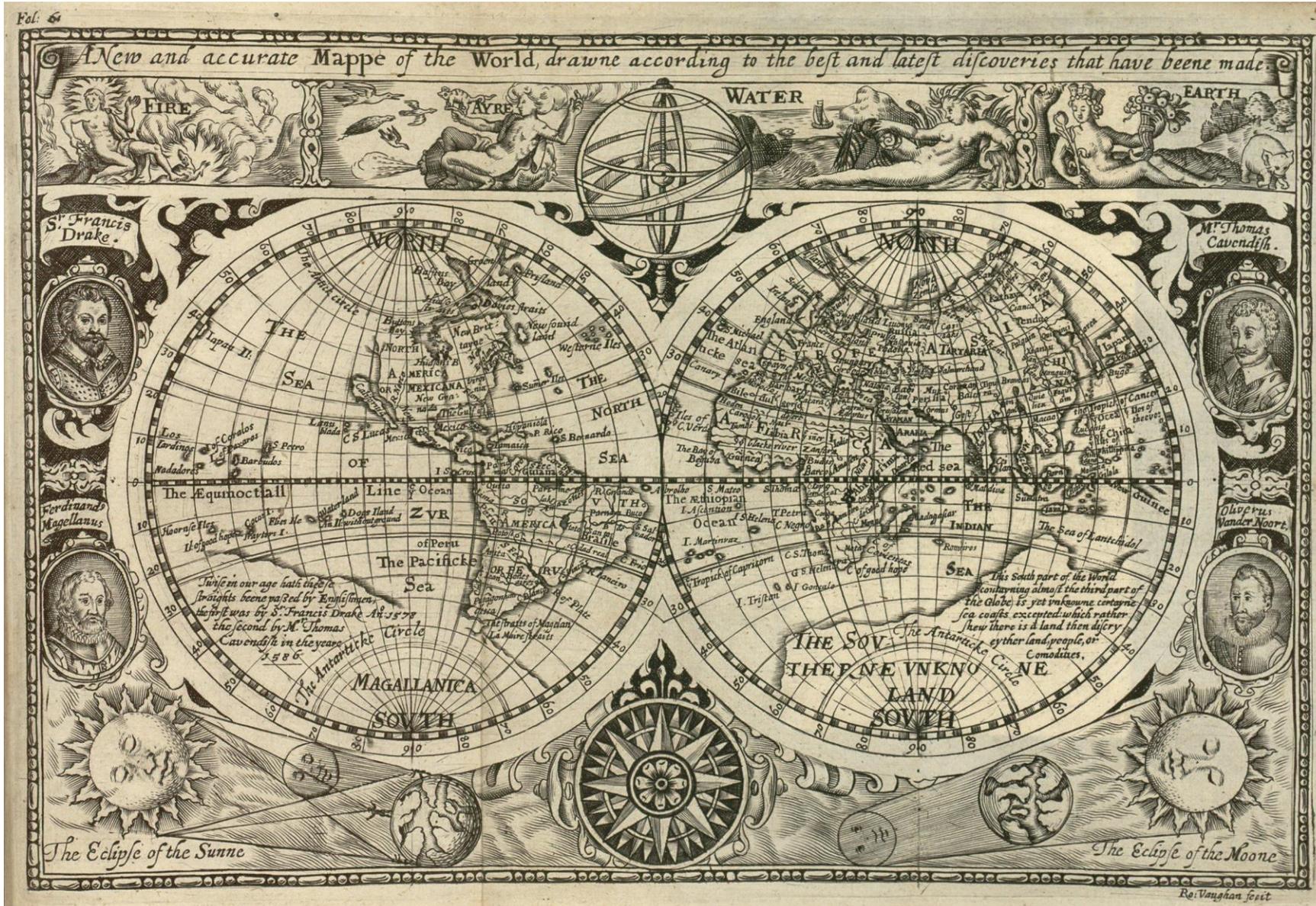
Cantino Planisphere, 1502 (Designed for Navigation)



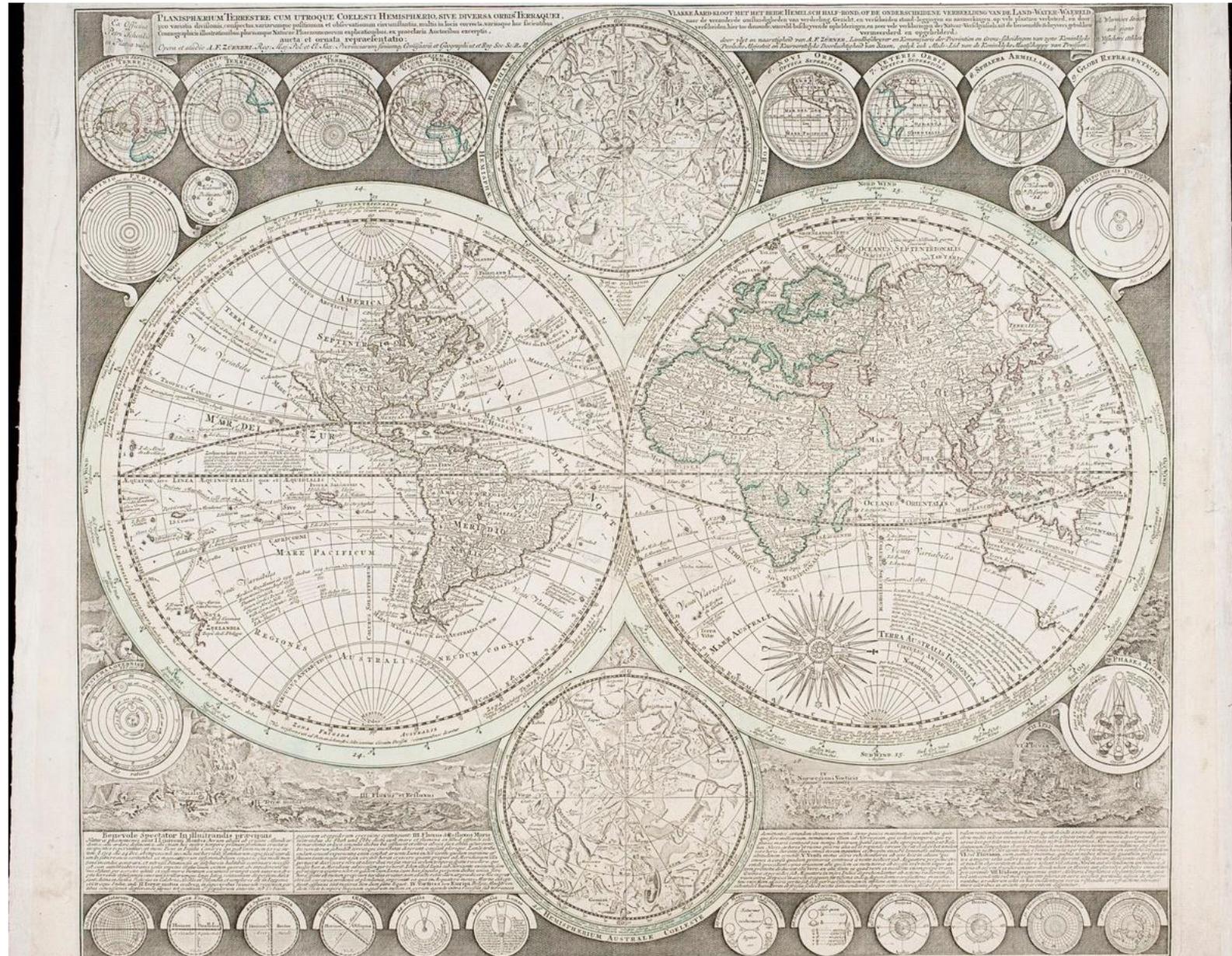
The Americas, 16th Century



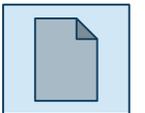
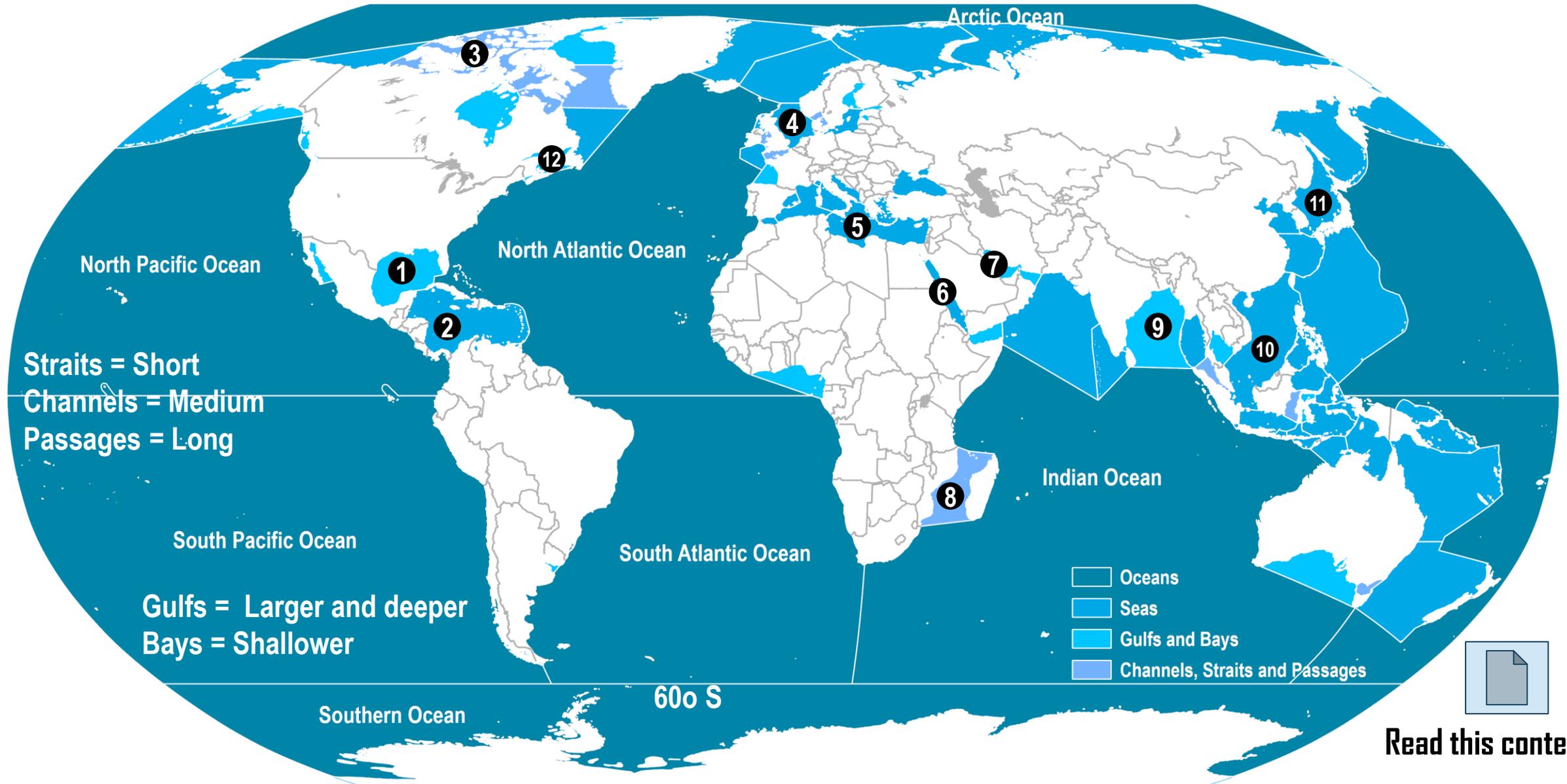
1628 World Map by Vaughan



Planisphaerium terrestre cum utroque coelesti hemisphaerio, circa 1700

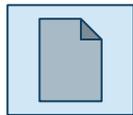
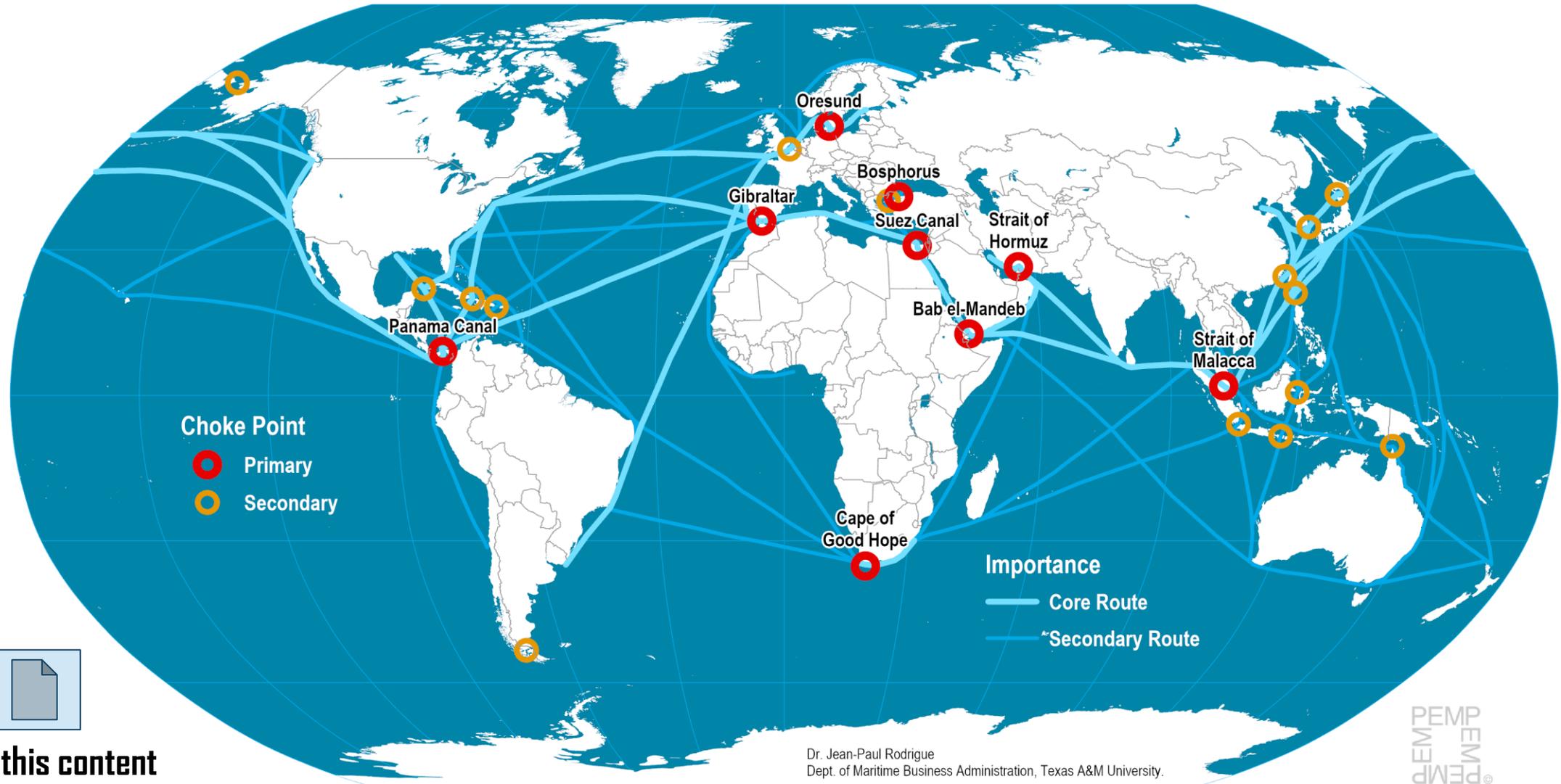


Main Water Masses of the World



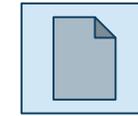
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Main Maritime Shipping Routes and Chokepoints

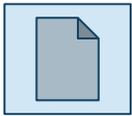
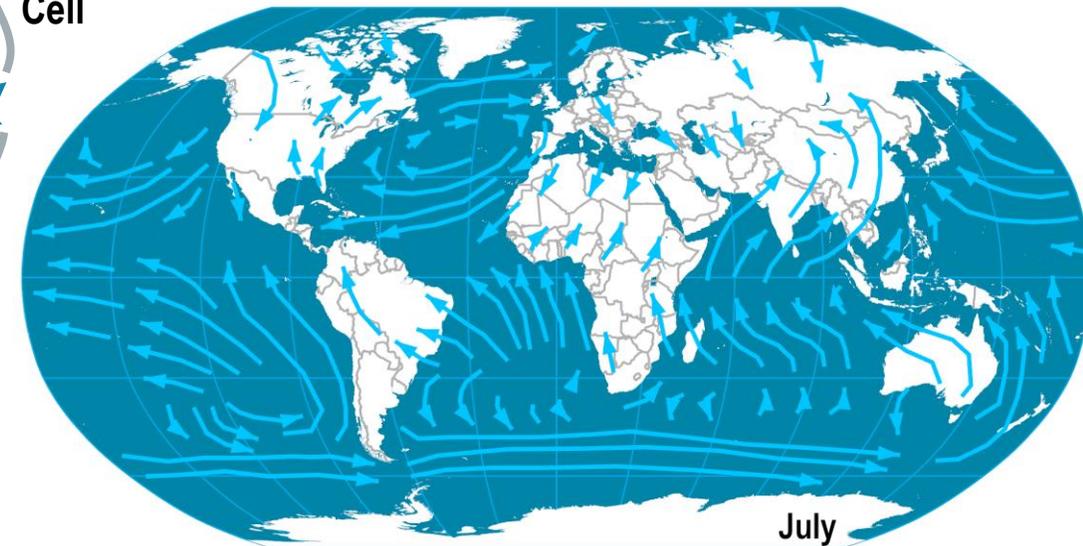
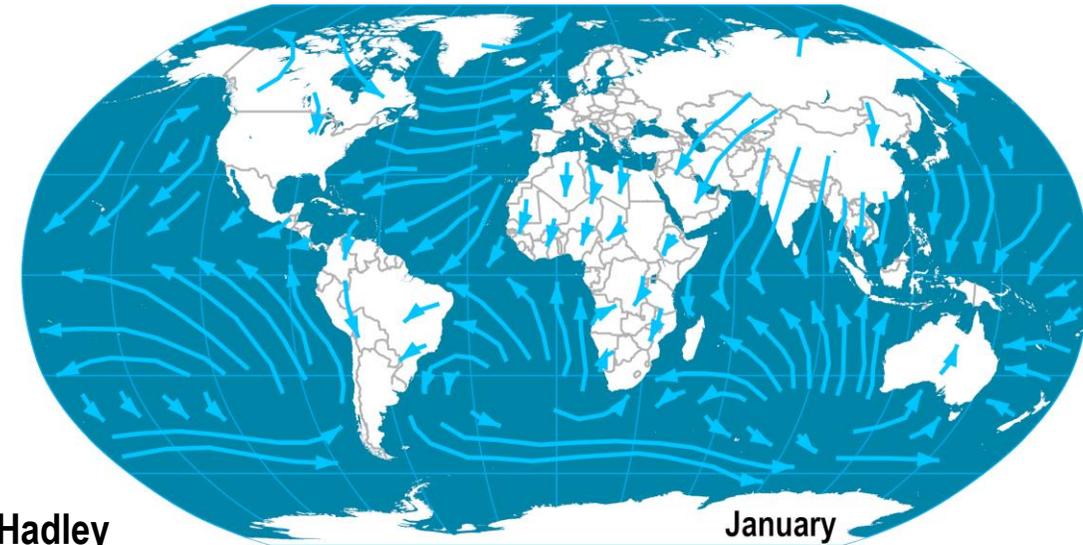
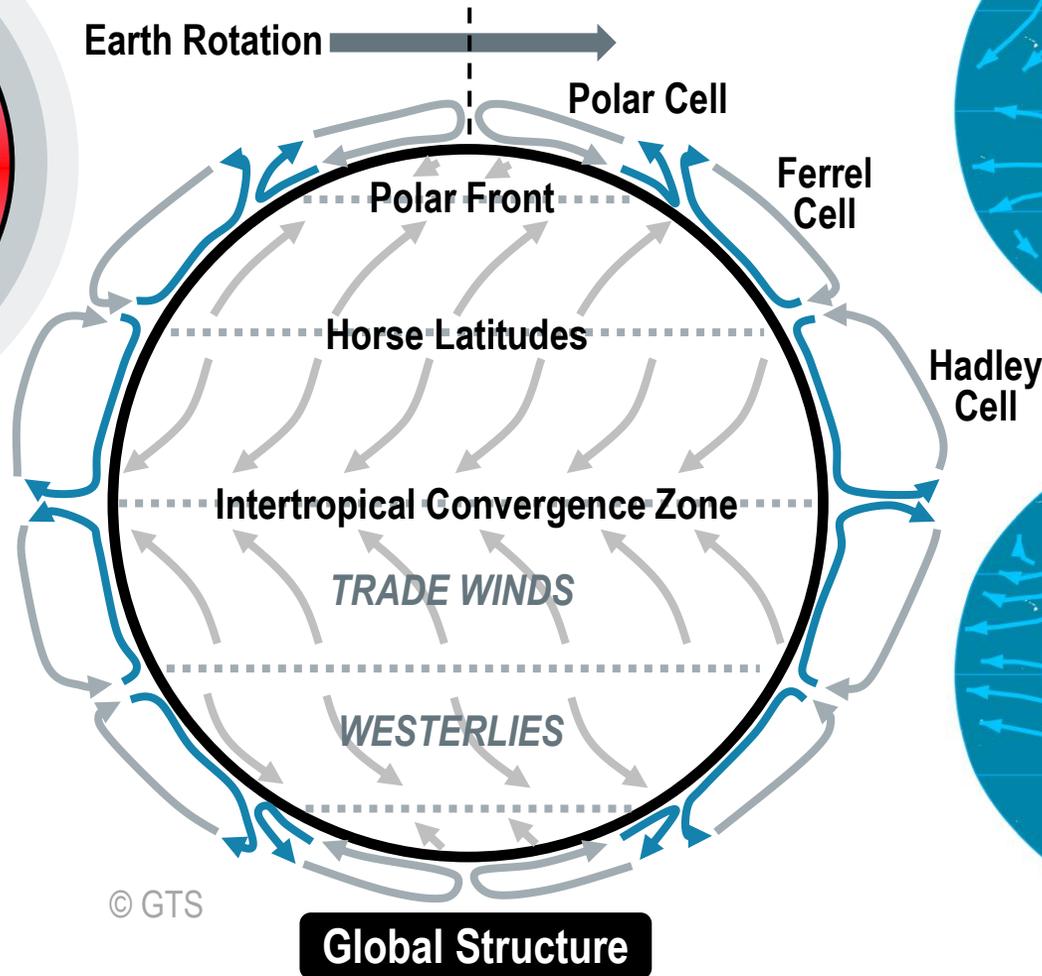
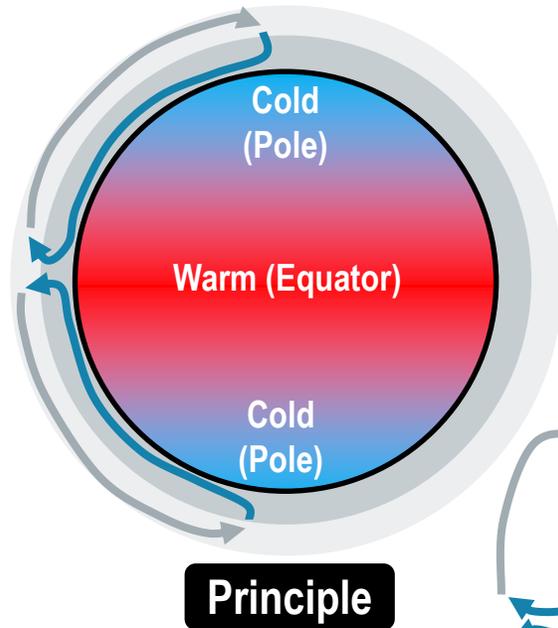


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Global Wind Patterns and their Seasonal Variation



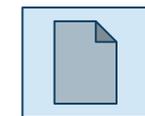
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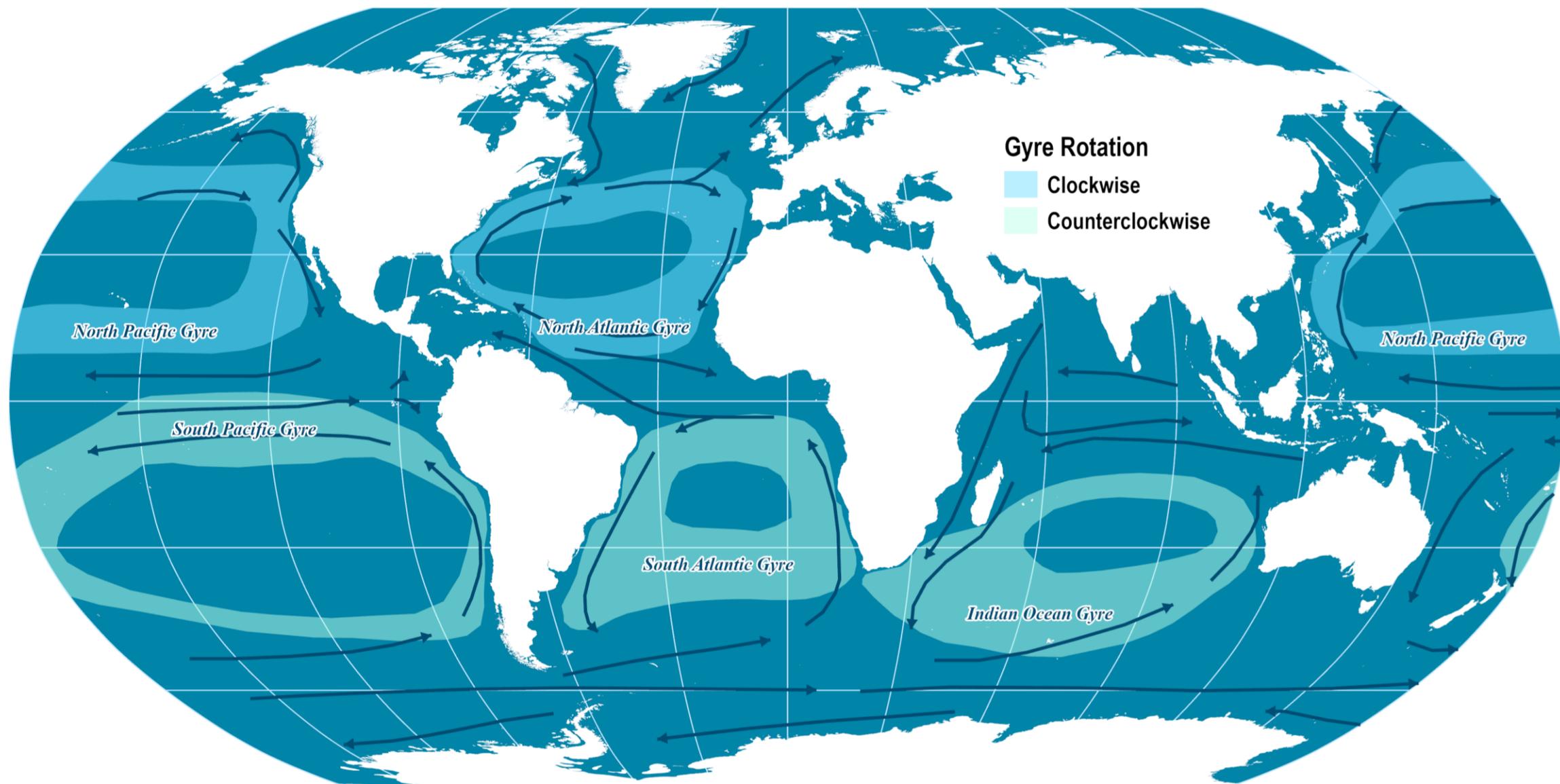
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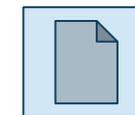
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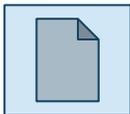


Great Circle Distance between New York, Moscow and Tokyo



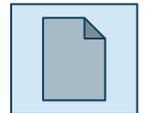
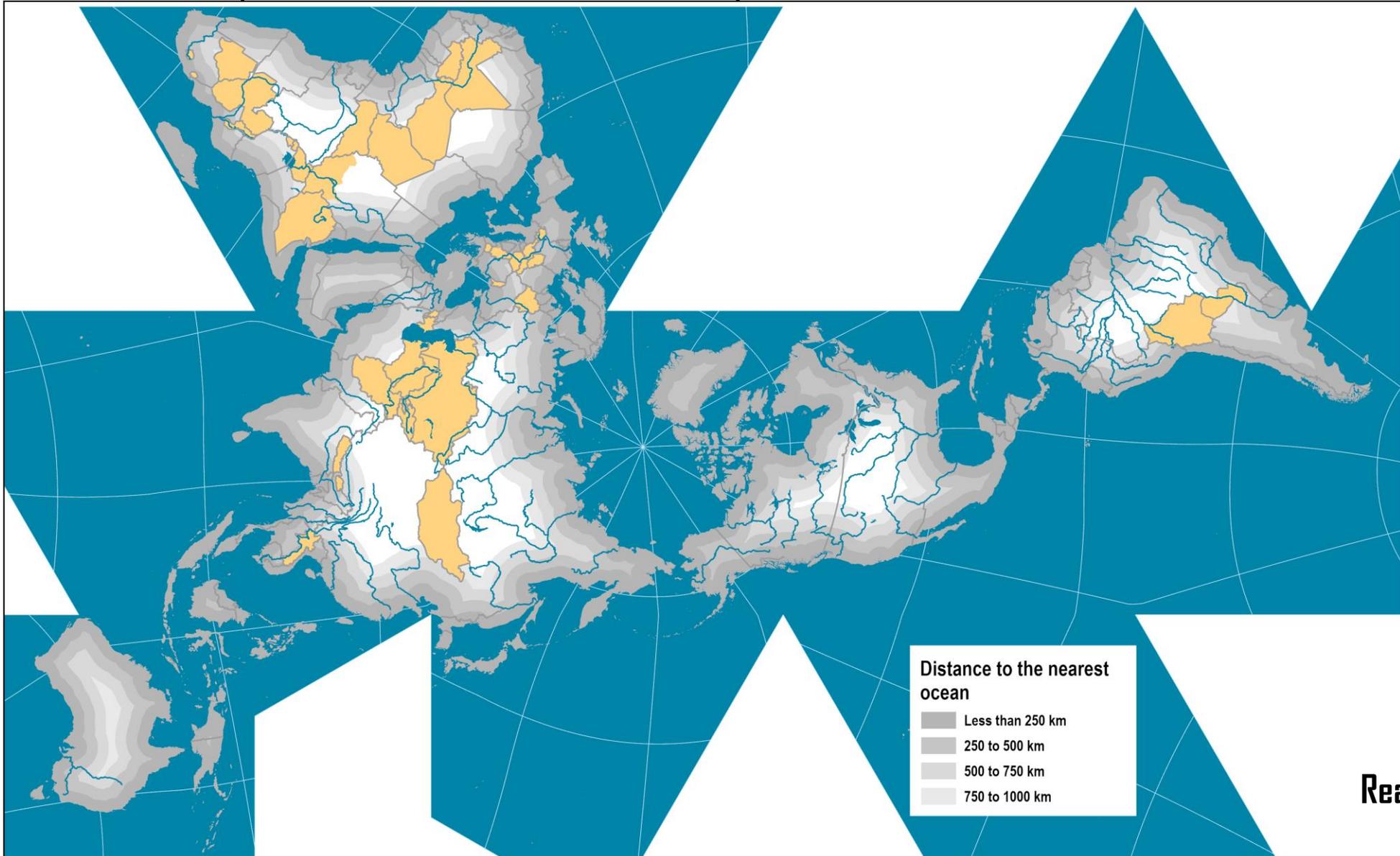
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