

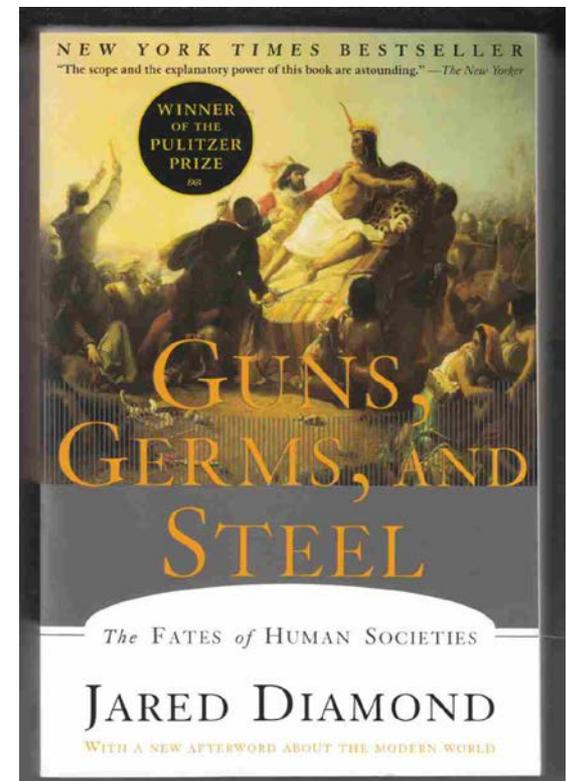
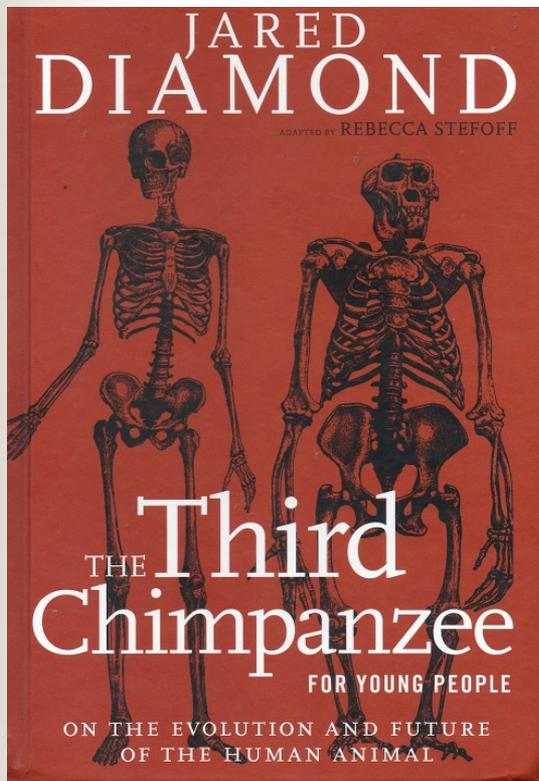
Linking biology and history together



What can the natural sciences tell us about world history?

Guns, Germs and Steel

- Jared Diamond: Guns, Germs and Steel



WAR





Ape wars

- Chimpanzee are ferocious when it comes to intergroup conflicts.
- Chimps do not wage open warfare
- They prefer raids, and one-to-many battles
- Bonobos do not have war at all.
- Females are peaceful, and will promote intergroup peace as well (and sex!)

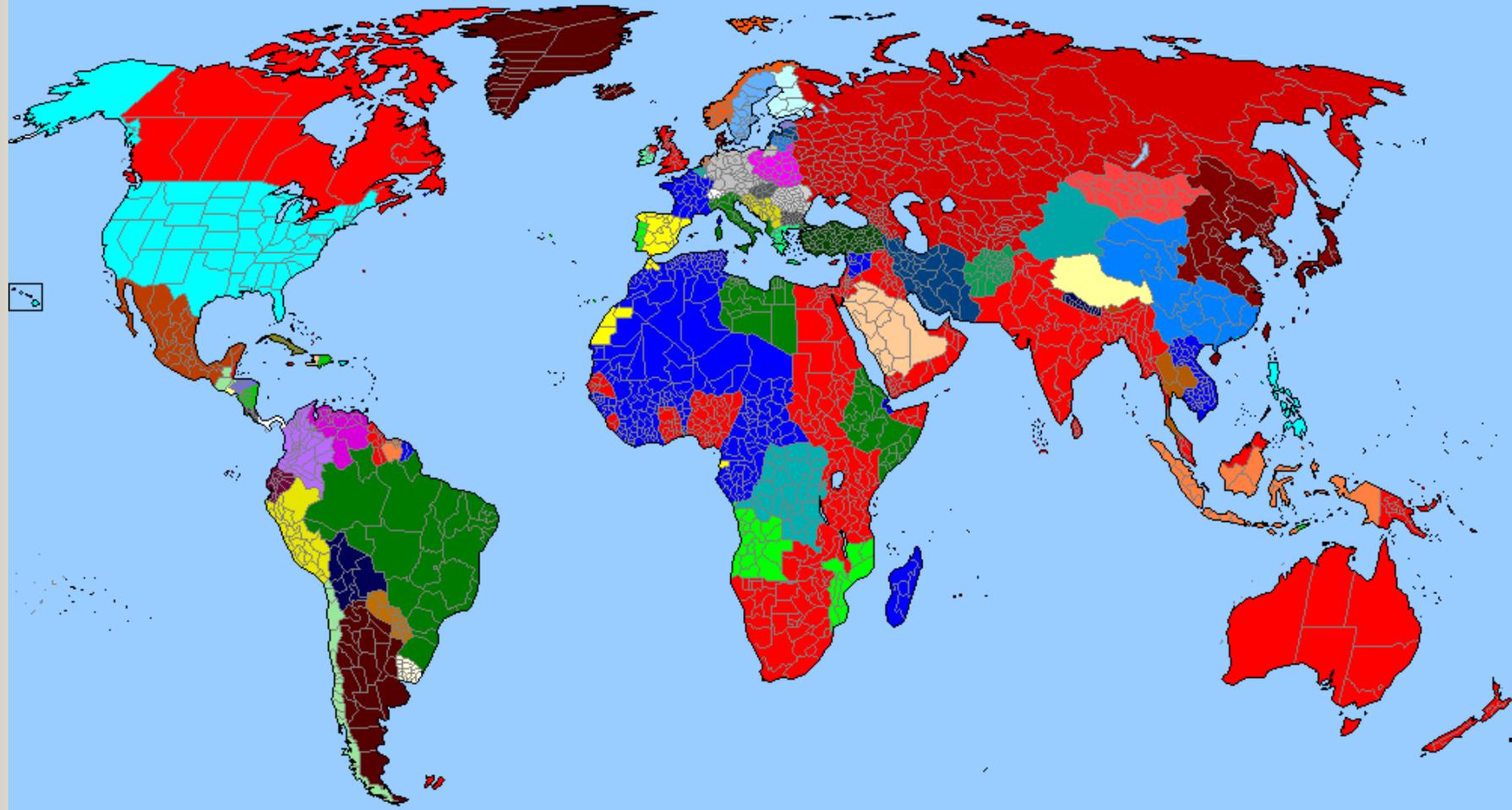
Hunter-Gatherers

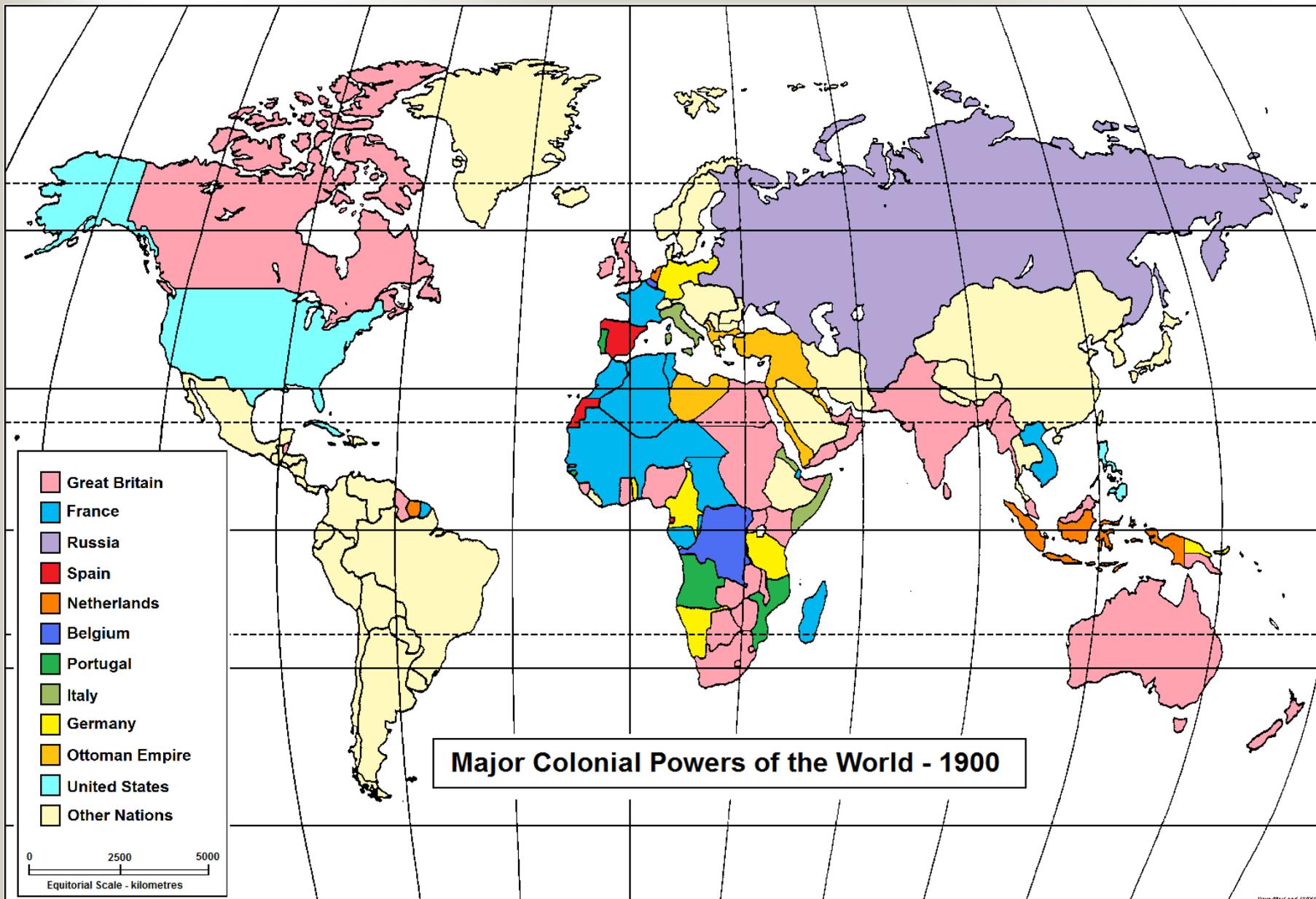
- Hunter gatherer warfare is not much different from chimpanzee warfare
- It focuses on raids, instead of full scale warfare



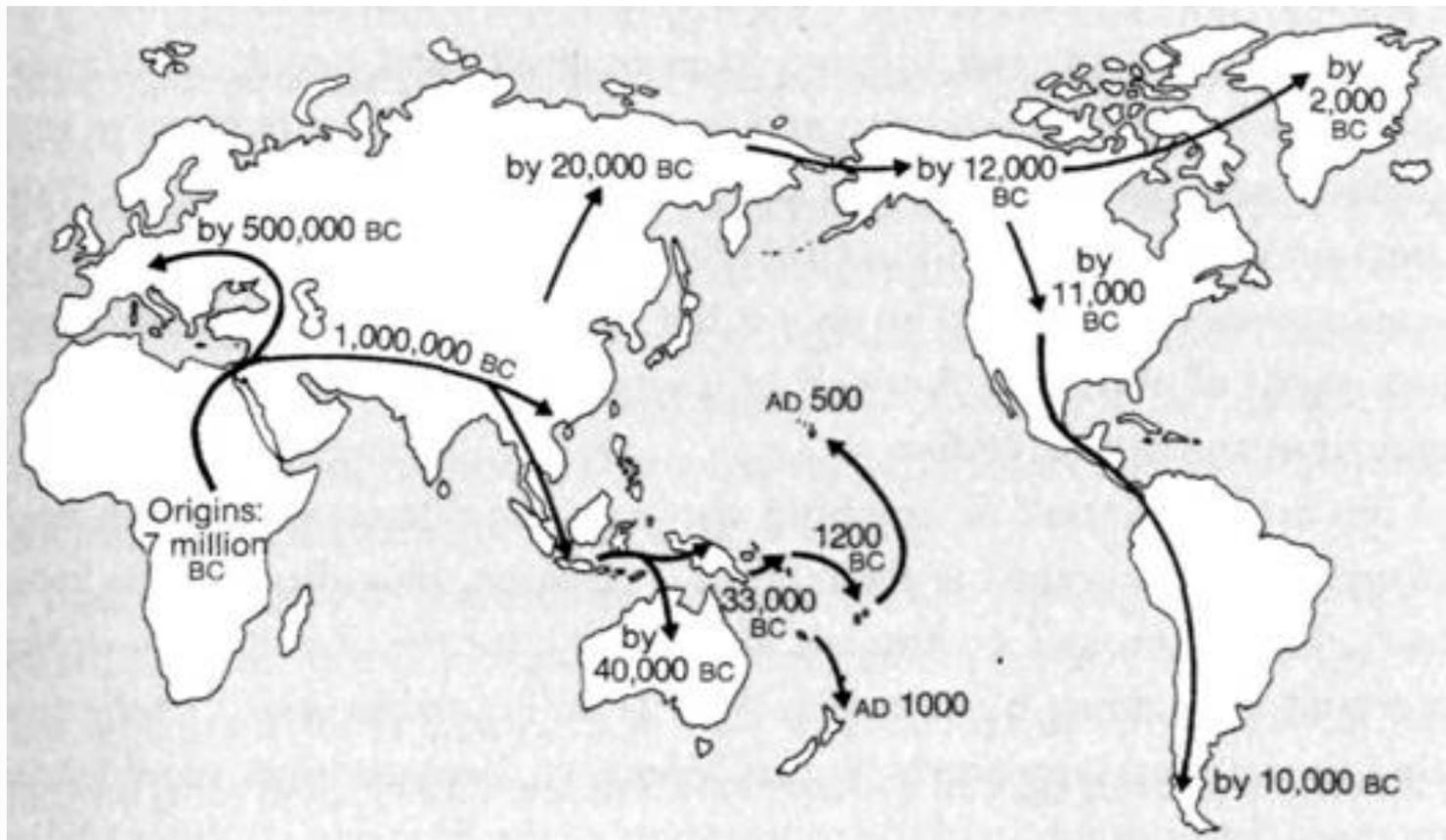
World Political







Dispersal of modern human

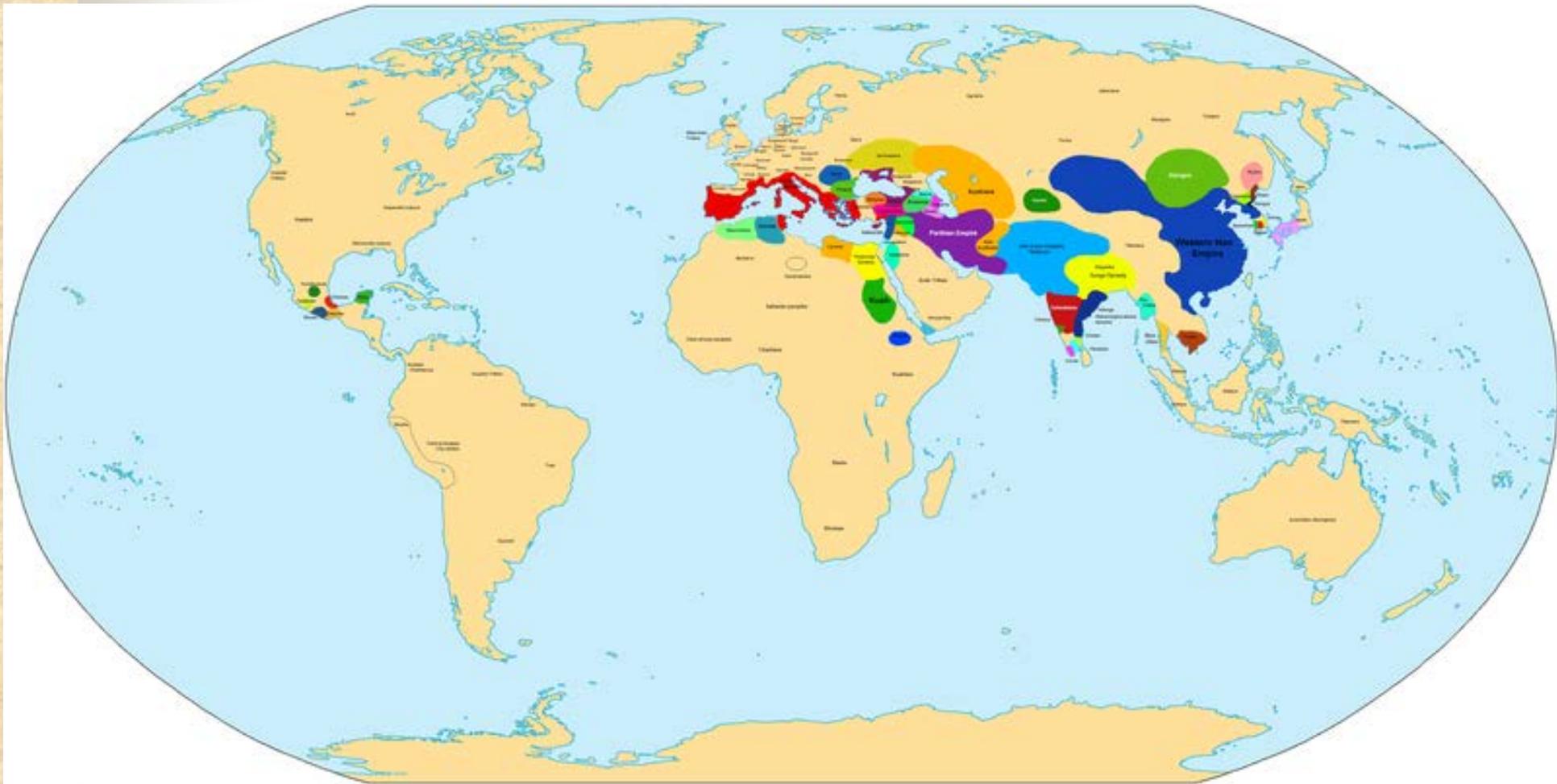




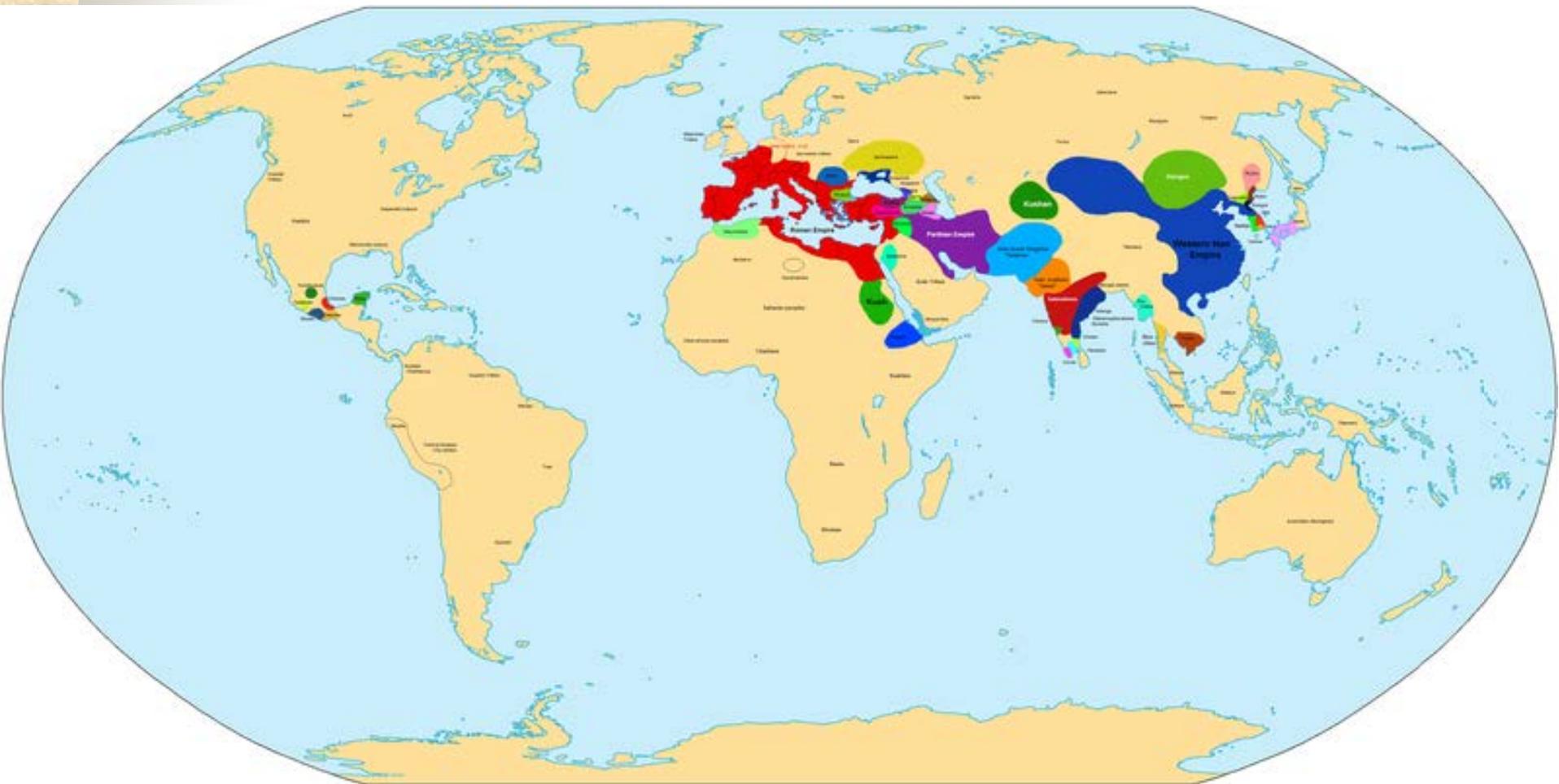
Different advancement trajectories

- In BC 11000 the world was populated by humans and the technological levels was the same everywhere
- By AD 1500 Eurasia was on the brink of the industrial revolution, Central and South America had literary civilizations. The rest of the world might have agriculture, but hunting-gathering was the norm.

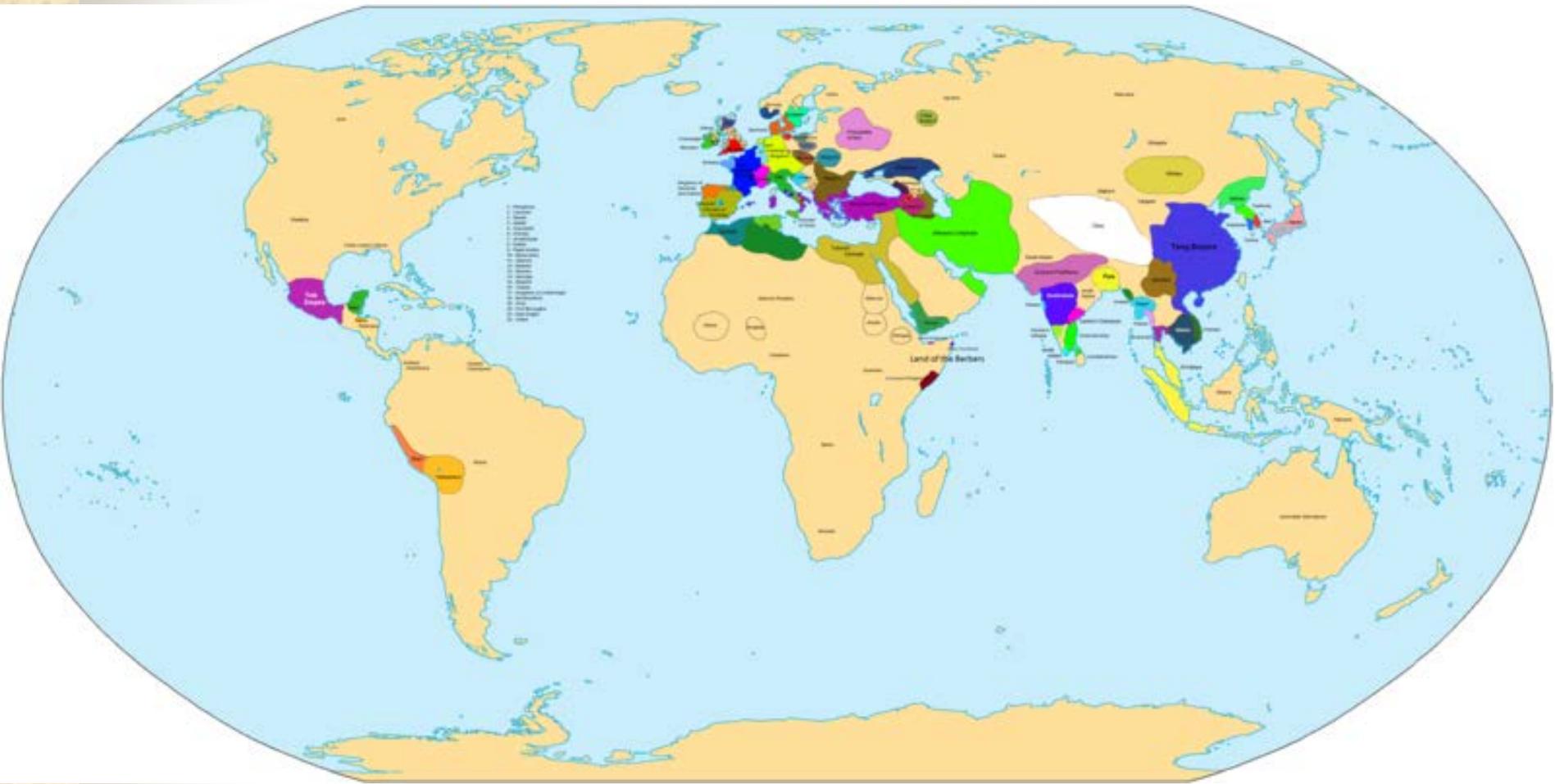
BC 100



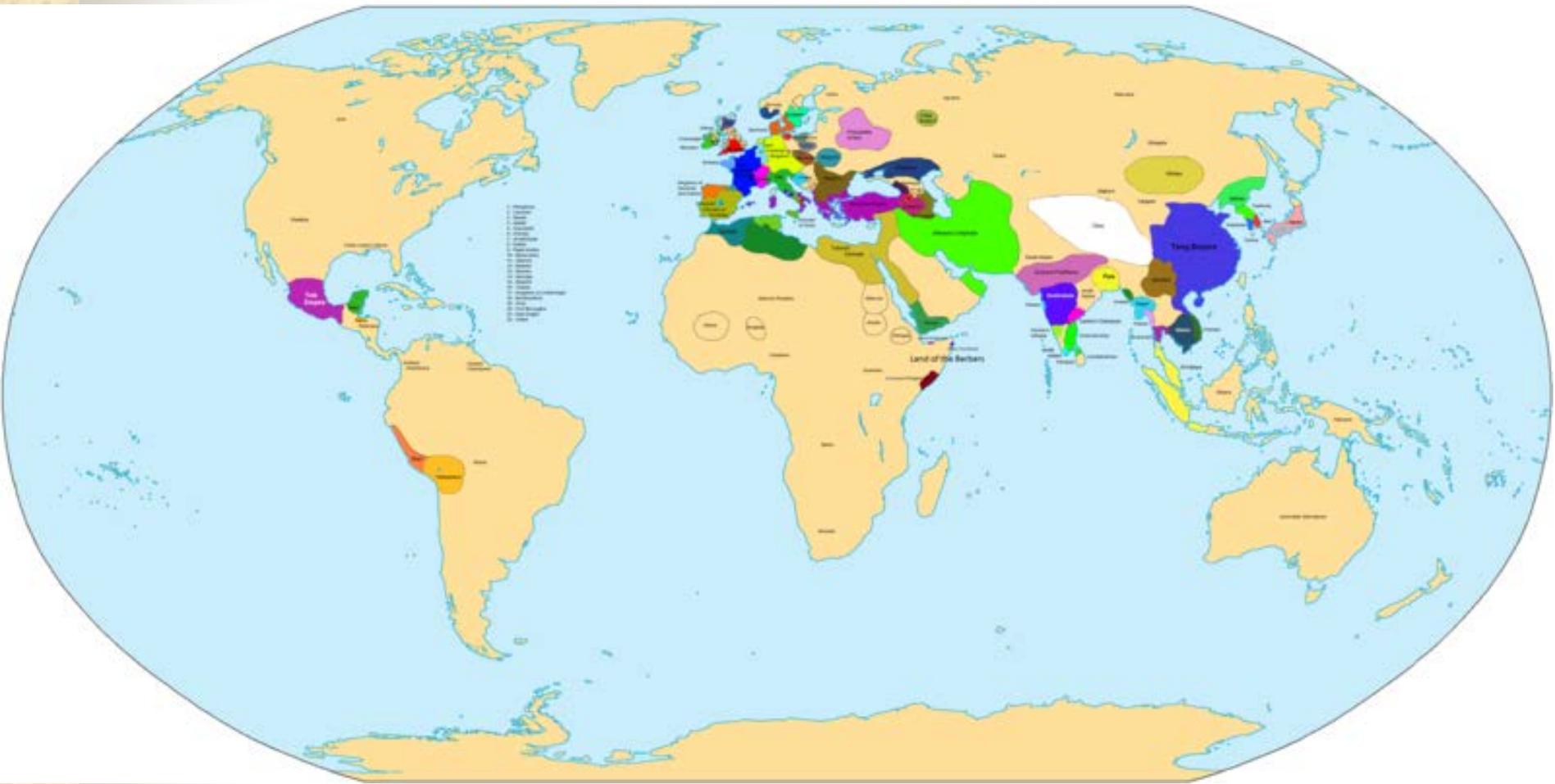
BC 1



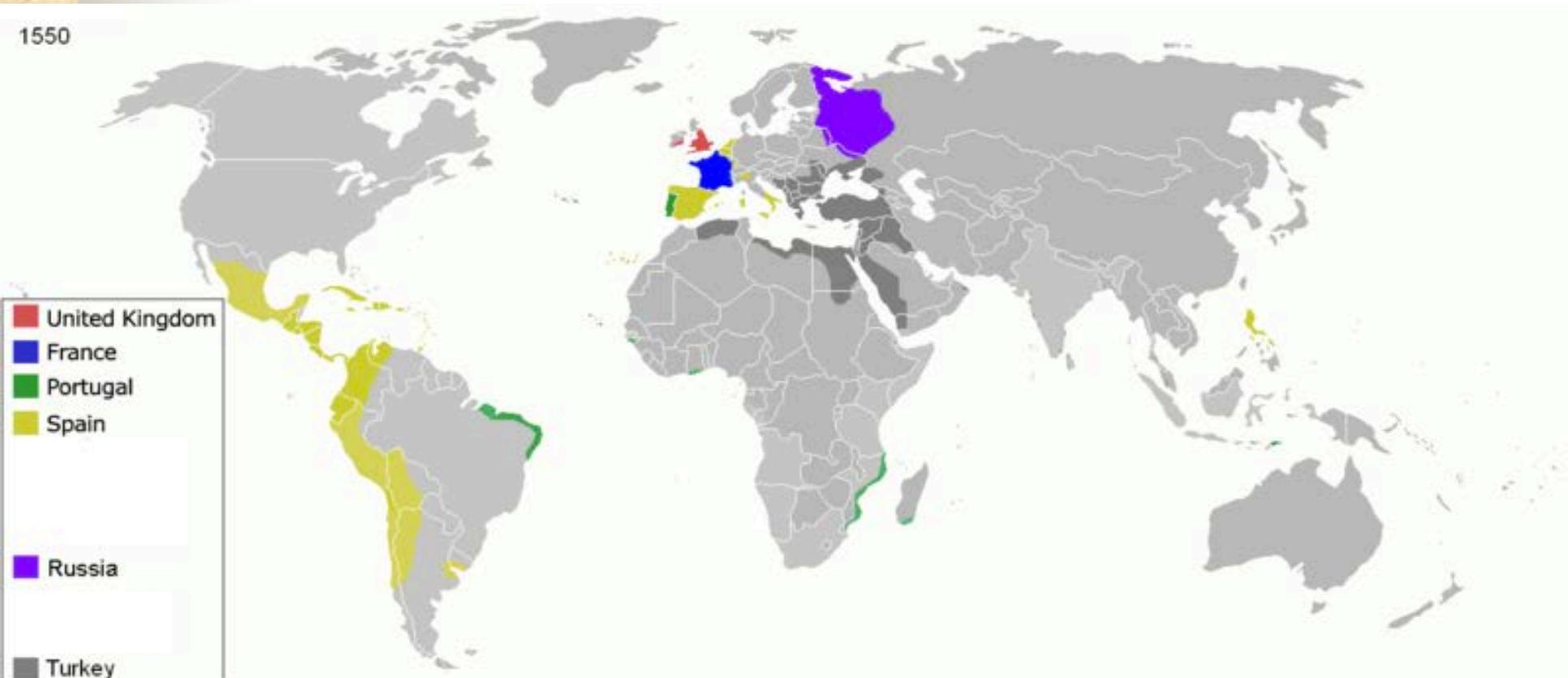
AD 900



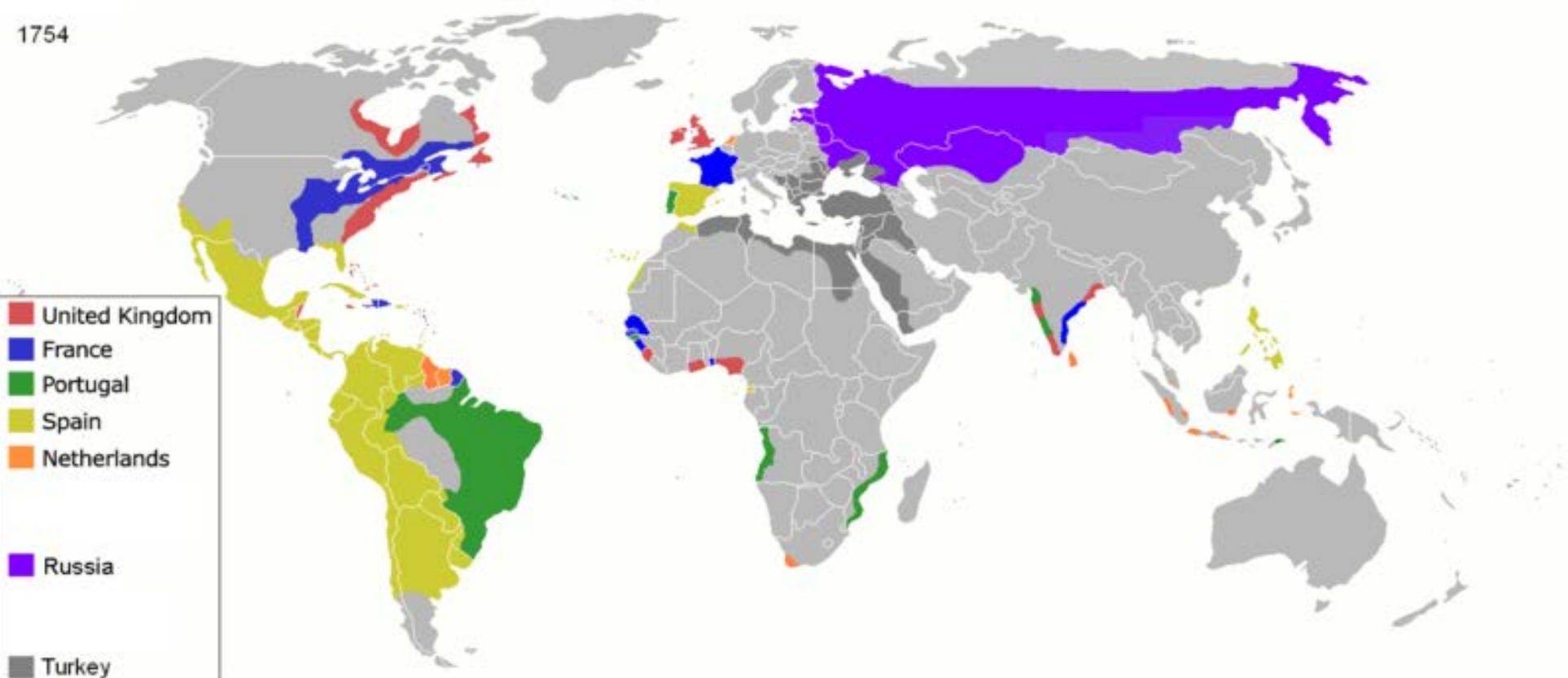
AD 900



AD 1550

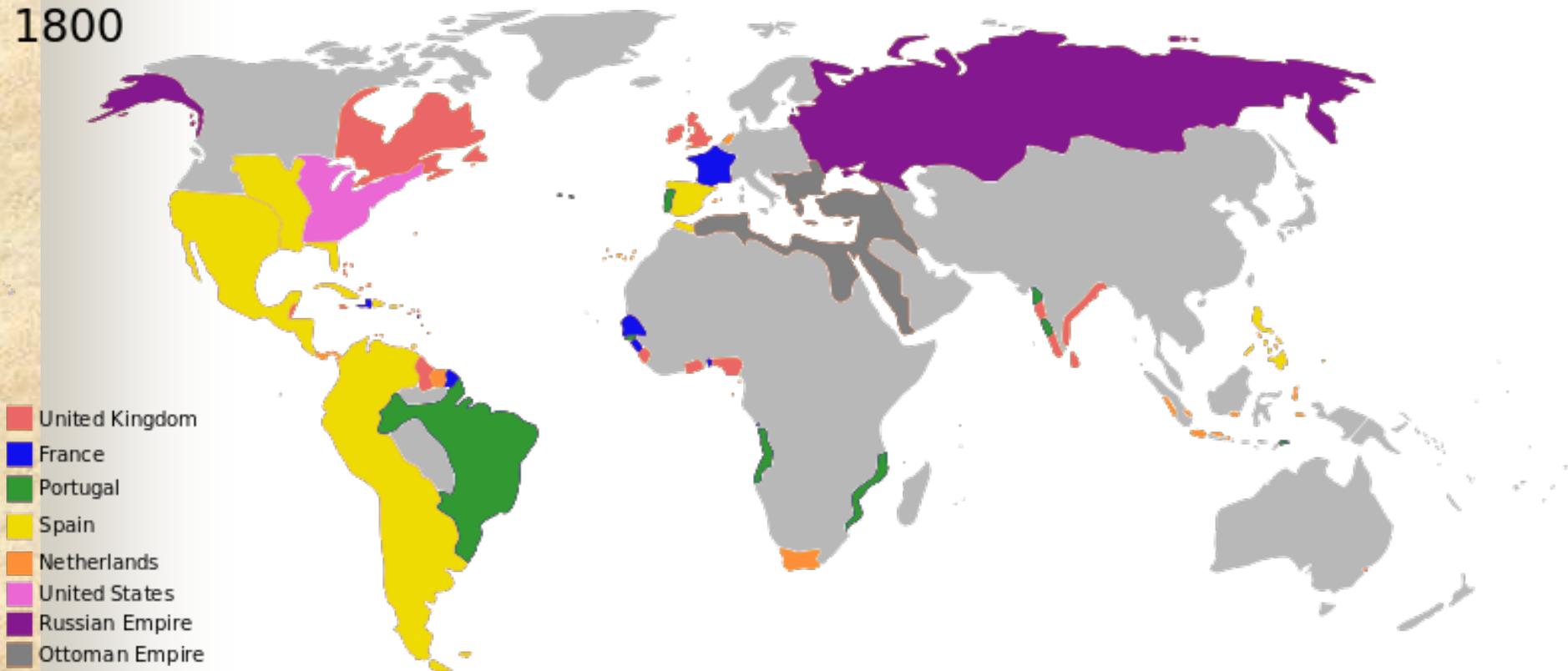


AD 1754

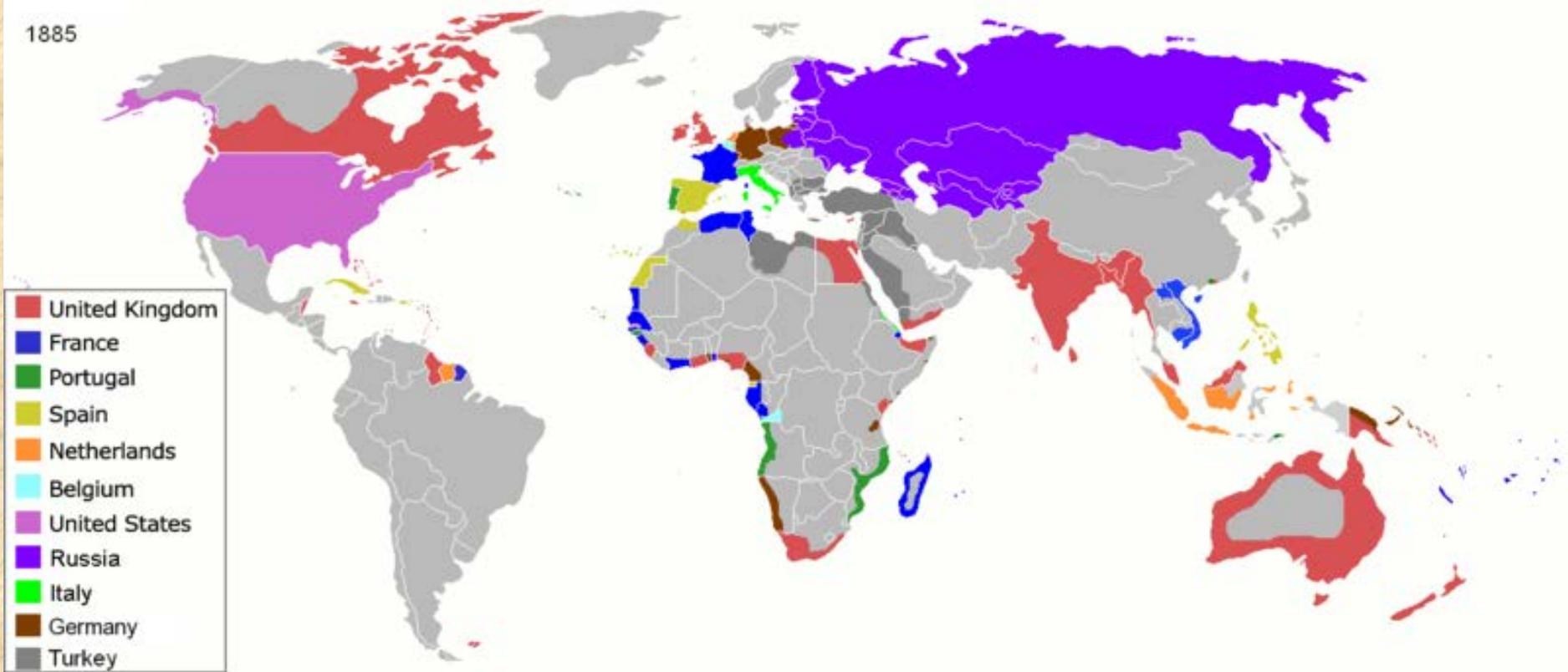


AD 1800

1800



AD 1885

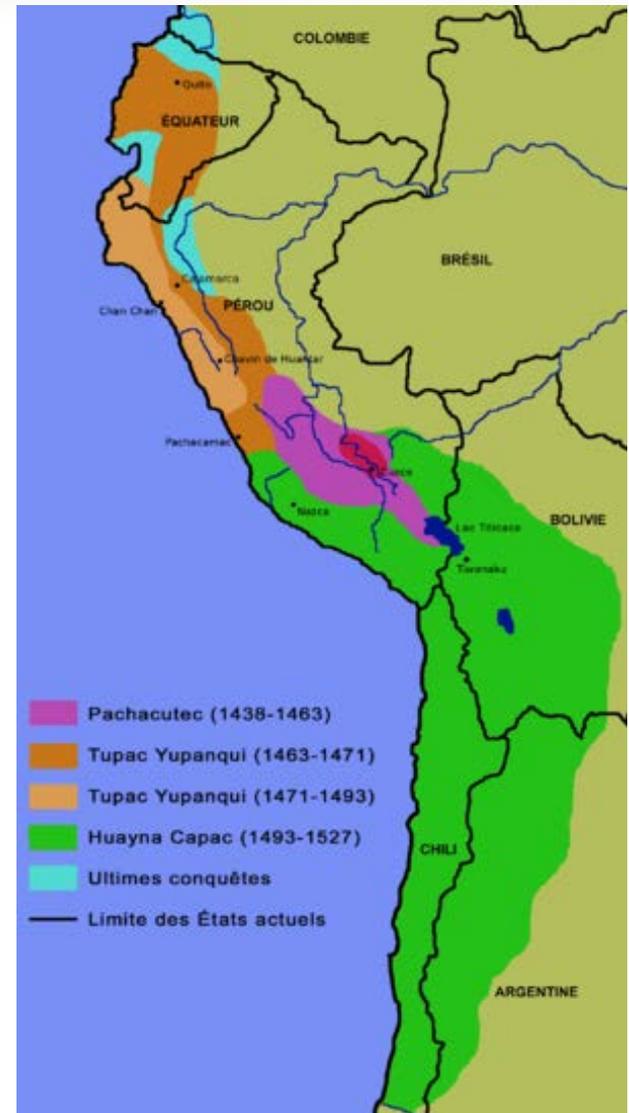


Pizzaro captures then kills the Inca ruler Atahualapa



Cortés conqueres the Aztec empire







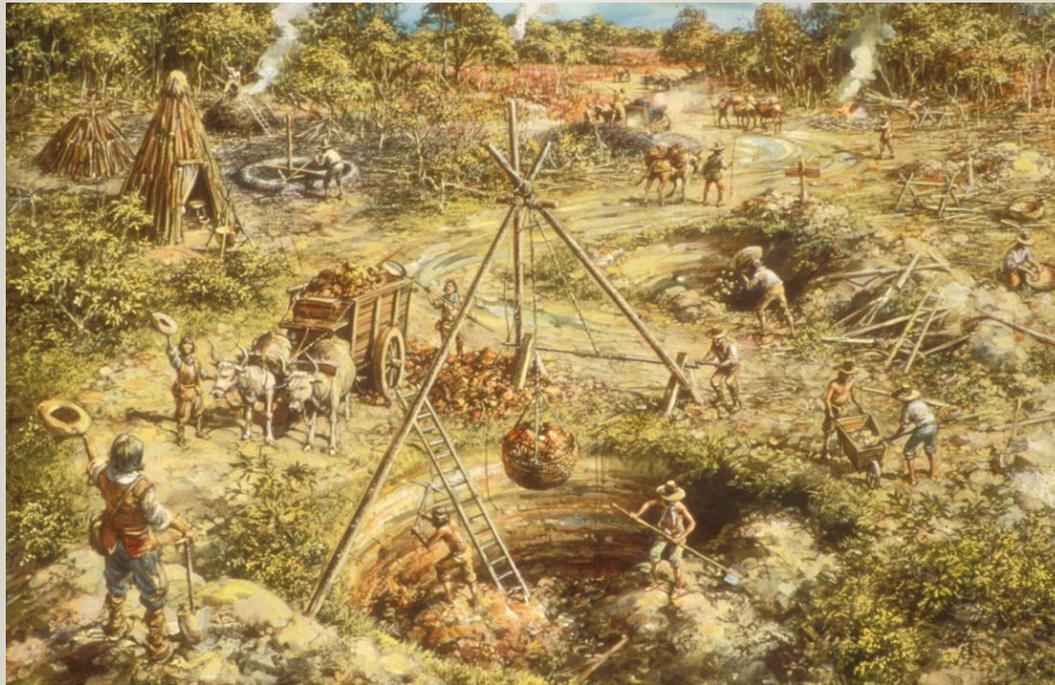
Yali's question

- "Why is it that you white people developed so much cargo and brought it to New Guinea, but we black people had little cargo of our own?,,
- Jared Diamon's refused to accept the blanket answer: "Because white men are just more clever"



What does one need for technical advancement?

- High / dense population
- Agriculture (interrelated with the previous)
- Mineral resources



MINERAL RESOURCES



Distribution of key resources

- Iron and coal were available to humans in Europe, Asia and Africa.
- Thus they could enter the iron age
- Americas and Australia could not enter the iron age.
- Advanced societies in America know how to work with metals (bronze, gold, silver).

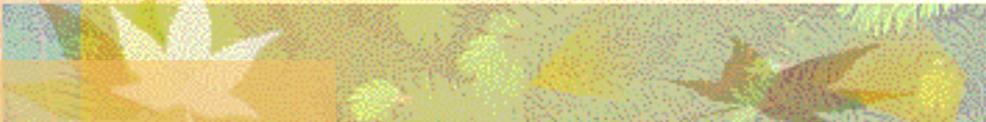


Key resources now

- Oil is the most important resource now
- Oil is only used since the end of the XIX.c.
- Oil in the Middle East and in Africa was discovered since the end of WWII
- Australia and Americas are rich in non-ferrous metals, oil, uranium. Resources that are important now, but were not important for most of our history



AGRICULTURE



Agricultural plants

- Edible
- Sowable
- Quick germination
- Seed does not fall off
- Easily stored (do not rot)

Domestication centers

SW Asia	wheat, pea, olive	sheep, goat	BC 8500
China	rice, millet	pig, silk-worm	BC 7500
Central America	beans, corn, squash	turkey	BC 3500
Andes and Amazonia	potato, cassava	llama, guinea pig	BC 3500
Kelet USA	Sunflower, <i>goosefoot</i>	-	BC 2500
?Sahel	Sorghum, African rice	Guinea fowl	BC 5000
?Tropical Western Africa	Oil palm, African yam	-	BC 3000



Domestication centers

Ethiopia	Coffee, <i>teff</i>	-	?
New Guinea	Sugar cane, banana	-	BC 7000
Western Europe	Poppy, oat	-	BC 6000-3500
Indus valley	Sesame, eggplant	cattle	BC 7000
Egypt	figs, <i>chufa</i>	cat, donkey	BC 6000



World's Agricultural Production in numbers

- FOA = Food and Agriculture Organization of the UN (2012-es adat)
- Cereals = 2.545 million tons
- Sugar cane = 1.832 million tons
- Vegetables and squashes = 1.106 million tons
- Roots = 809 million tons
- Fruit = 636.5 million tons
- Meat = 302 million tons
- Fish = 94 million tons



Word's total production 2012

Individual plant	Production (million tonns)
Sugarcane	1842.2
Maize (corn)	872.8
Rice	738.2
Wheat	671.5
Potato	365.3
Sugar beet	269.8
Cassava	269.1
Soybeans	241.1
Tomato	161.8
Barley	133.5
Sweet potatoes	108.0
Water melon	105.3
Banán	102.0
Hagyma	82.8
Gyapotmag	76.5

Production of Hungary

1 Maize	Central-America	4741500		
2 Wheat	Fertile crescent	3740000		
3 Milk, cow	Europe, Asia. North Africa	1798174		
4 Sunflower seed	North America	1316545		
5 Barléey	Fertile crescent	995700		
6 Sugar beet	Mediterraneum	769700		
7 Apple	Central Asia	650595		
8 Potato	South America	511100	11 Pig meat	Asia, China 384322
9 Maize, green	Central-America	433613	12 Grape	Near East 356363
10 Rapeseed	Medetteraneum	414637	13 Triticale	345092
			14 Chicken meat	India 290506
			15 Watermelon	South Africa 182709
			16 Oats	Fertile crescent 137151
			17 Eggs, hen	131100
			18 Tomatos	South America 108799
			19 Vegetables, other	94834
			20 Peppers	Central America 92608

Production of Brazil

1 Sugarcane	Central-America	721077287
2 Maize	South Asia / Melanesia	71072810
3 Soybeans	East Asia	65848857
4 Milk, whole fresh cow	Europe, Asia	32304421
5 Cassava / Brazilian arrowroot	South America	23044557
6 Oranges	South Asia	18012560
7 Chicken meat	India / South Asia	11588139
8 Rice	South Asia	11549881
9 Cattle meat	Europe / Middle East	9399963
10 Bananas	Indonesia / South East Asia	6902184
11 Wheat	Fertile Crescent	4418388
12 Tomatoes	South America	3873985
13 Potatoes	South America	3731798
14 Pig meat	East Asia, China	3465216
15 Cottonseed	Tropical regions in the world	3130510
16 Coffee, green	Africa, Arabia	3037534
17 Coconuts	Around the tropics, but not in Africa	2931531
18 Vegetables, other		2900000
19 Beans, dry	Mexico	2794854
20 Pineapples	South America	2478178

Production of France

1	Wheat	Fertile crescent	40300800
2	Sugar beet	Mediterraneum	33688393
3	Milk, whole fresh cow		23983197
4	Maize	Central America	15614100
5	Barley	Fertile crescen	11347000
6	Potatoes	South America	6340807
7	Rapeseed	Medetteraneum	5463185
8	Grape	Near East	5338512
9	Triticale		2300503
10	Pig meat	East Asia, China	2090300
11	Cattle meat	Europe, Asia	1924924
12	Sunflower seed		1572952
13	Apples	Central Asia	1382901
14	Chicken meat	South Asia, India	1178600
15	Vegetables, other		1062598
16	Eggs, hen		853630
17	Milk, goat	East Europe / SW Asia	624016
18	Peas, green	Mediterranean basin and the Near East	591100
19	Tomatoes	South America	588660
20	Peas, dry	Mediterranean basin and the Near East	561522



Cereals

- WHEAT (*Triticum spp.*)
- RICE PADDY (*Oryza sativa*)
- BARLEY (*Hordeum spp.*)
- MAIZE / CORN (*Zea mays*)
- RYE / Rozs / Centeio / Seigle (*Secale cereale*)
- OAT / Abrakzab / Aveia-comum / Avoine cultivée (*Avena sativa*)
- MILLET / Köles / Milhete / Millet (different species)
- SORGHUM / Cirok / Sorghum / Sorghum (*Sorghum spp.*)
- BUCKWHEAT / Hajdina / Trigo sarraceno / Sarrasin (*Fagopyrum esculentum*)
- QUINOA / Rizsparéj / Quinoa / Quinoa (*Chenopodium quinoa*)
- FONIO (*Digitaria spp.*)
- TRITICALE (cross between wheat and rye)
- CANARY SEED (*Phalaris canariensis*)



Roots and tubers

- Potato / Burgonya (*Solanum tuberosum*)
- Batata / Édesburgonya (*Ipomoea batatas*)
- Cassava / manióka (*Manihot esculenta*, syn. *M. utilissima*; *M. palmata*, syn. *M. dulcis*)
- (*Xanthosoma spp.*) YAUTIA (COCOYAM)
- Taro (*Colocasia esculenta*): Asia and Oceania
- Yams (*Dioscorea spp.*):
- Other: arracacha (*Arracacia xanthorrhiza*); arrowroot (*Maranta arundinacea*); chufa (*Cyperus esculentus*); sago palm (*Metroxylon spp.*); oca and ullucu (*Oxalis tuberosa* and *Ullucus tuberosus*); yam bean, jicama (*Pachyrhizus erosus*, *P. angulatus*); mashua (*Tropaeolum tuberosum*); Jerusalem artichoke, topinambur (*Helianthus tuberosus*)



Pulses

- Bean (*Phaseolus vulgaris*): America
- broad beans (*Vicia faba*): America
- Pea (*Pisum sativum*): Asia
- chick peas (*Cicer arietinum*): Asia minor
- cow peas (*Vigna unguiculata*): West Africa
- pigeon peas (*Cajanus cajan*): India
- Lentils (*Lens culinaris*): Asia
- Bambara groundnut (*Vigna subterranea*): West Africa
- bitter vetch (*Vicia ervilia* , *Vicia sativa*): Mediterranean
- Lupine (*Lupinus* sp.): Mediterranean and South America (different species)
- Other: lablab or hyacinth bean (*Dolichos* spp.); jack or sword bean (*Canavalia* spp.); winged bean (*Psophocarpus tetragonolobus*); guar bean (*Cyamopsis tetragonoloba*); velvet bean (*Stizolobium* spp.); yam bean (*Pachyrrhizus erosus*)



Nuts

- Para nut / Brazilian nut (*Bertholletia excelsa*)
- Cashew (*Anacardium occidentale*): Brazil
- Chestnut (*Castanea sp.*)
- Almonds (*Prunus dulcis*)
- Walnut (*Juglans sp.*)
- Pistachios (*Pistacia vera*)
- Kolanut (*Cola nitida*; *C. vera*; *C. acuminata*)
- Hazelnut (*Corylus avellana*)
- Betelnut / Areca nut (*Areca catechu*)
- Other nuts: pecan nut (*Carya illinoensis*); butter or swarri nut (*Caryocar nuciferum*); pili nut, Java almond, Chinese olives (*Canarium spp.*); paradise or sapucaia nut (*Lecythis zabucajo*); Queensland, macadamia nut (*Macadamia ternifolia*); pignolia nut (*Pinus pinea*)



Vegetables

- CABBAGES
- ARTICHOKEs
- ASPARAGUS
- LETTUCE
- SPINACH
- CASSAVA LEAVES
- FRESH TOMATOES
- CAULIFLOWER
- PUMPKINS
- CUCUMBERS AND GHERKINS
- EGGPLANTS
- CHILLIES AND PEPPERS
- GREEN ONIONS
- DRY ONIONS
- GARLIC
- LEEKS AND OTHER ALLIACEOUS VEGETABLES
- GREEN BEANS
- GREEN PEAS
- GREEN BROAD BEANS
- STRING BEANS
- CARROTS
- OKRA
- GREEN CORN
- Fungi
- WATERMELONS
- CANTALOUPEs MELONS
- FRESH VEGETABLES OTHER



Fruits

- BANANAS
- PLANTAINS
- ORANGES
- TANGERINES AND MANDARINS AND CLEMENTINES AND SATSUMAS
- LEMONS AND LIMES
- GRAPEFRUIT AND POMELO
- CITRUS FRUIT NES
- APPLES
- PEARS
- QUINCES
- SPOME FRUIT NES
- APRICOTS
- SOUR CHERRIES
- CHERRIES
- PEACHES AND NECTARINES
- PLUMS
- STONE FRUIT
- STRAWBERRIES
- RASPBERRIES
- GOOSEBERRIES
- CURRANTS
- BLUEBERRIES
- CRANBERRIES
- BERRIES NES
- GRAPES
- FIGS
- PERSIMMONS
- KIWI FRUIT
- MANGOES
- AVOCADOS
- PINEAPPLES
- DATES
- CASHEWAPPLE
- PAPAYAS
- TROPICAL FRUIT OTHER
- FRESH FRUIT OTHER



Stimulants

- Coffe (*Coffea sp.*) - Africa
- Cacao (*Theobroma cacao*) – South America
- Tea (*Camellia sinensis*) - Asia
- Mate (*Ilex paraguariensis*) – South America



Fibre crops

- COTTON LINT
- [FLAX RAW OR RETTED]
- FLAX FIBRE AND TOW
- HEMP FIBRE AND TOW
- KAPOK FIBRE
- JUTE
- JUTE-LIKE FIBRES
- RAMIE
- SISAL
- AGAVE FIBRES NES
- ABACA MANILA HEMP
- COIR
- FIBRE CROPS NES



ANIMAL DOMESTICATION

Animal products

Animal products	Production (million tonnes)
Milk, cow	625.8
Pig meat	109,1
Milk, buffalo	97.4
Chicken meat	92.8
Chicken eggs	66.4
Cattle meat	63.3
Milk, goat	17.8
Milk, sheep	10.1
Sheep meat	8,5
Turkey meat	5.6
Other eggs	5.5
Goat meat	5.3
Duck meat	4.3
Buffalo meat	3.6
Goose and guinea fowl meat	2.8
Milk, camel	2.8

Fishing

Fish species (english / hungarian / latin name)	Catch (tonne)
Other marine fish	10,423,369
Peruvian anchovy / perui szardella / <i>Engraulis ringens</i>	8,319,597
Other freshwater fish	6,055,890
Alaska pollock / alaszikai tőkehal / <i>Theragra chalcogramma</i>	3,206,513
Skipjack tuna / csíkoshasú tonhal / <i>Katsuwonus pelamis</i>	2,608,578
Atlantic herring / atlanti herring / <i>Clupea harengus</i>	1,778,488
Chub mackerel / japán makréla / <i>Scomber japonicus</i>	1,714,896
Japanese anchovy / japán szardella / <i>Engraulis japonicus</i>	1,321,662
Largehead hairtail / ezüstös sertefarkúhal / <i>Trichiurus lepturus</i>	1,258,628
Scads / / <i>Decapterus sp,</i>	1,231,816
Yellowfin tuna / sárgaúszójú tonhal / <i>Thunnus albacares</i>	1,223,907
Atlantic cod / atlanti tőkehal / <i>Gadus morhua</i>	1,049,667
Sardine / szardínia / <i>Sardina pilchardus</i>	1,036,708
Sardinellas other / egyéb szardinella /	965,431
Atlantic mackerel / közönséges makréla / <i>Scomber scombrus</i>	944,748
Jumbo flying squid / Humboldt-tintahal / <i>Dosidicus gigas</i>	906,310
Natantian decapods nei / egyéb úszó rákok	892,834



Animals

- Cattle / szarvasmarha / bœuf / boi (*Bos taurus*, *Bos indicus*, *Poephagus grunniens*)
- Buffalo / bivalyok / buffle / búfalo (*Bubalus bubalus*; *Bison bison*, *Bison bosanus*, *Syncerus spp.*)
- Sheep / juh / mouton / ovelha doméstica (*Ovis spp.*)
- Goat / kecske / chèvre / capra (*Capra spp*)
- Pig / disznó / porc / porco (*Sus domestica* / *Sus scrofa*)
- Chicken / csirke / poulet / galinha (*Gallus domesticus*)
- Helmeted guineafowl / Gyöngytyúk/ Pintade de Numidie / Galinha-d'angola (*Numida meleagris*)
- Duck / kacska / canarad / pato (*Anas spp.*)
- Goose / liba / oie / ganso (*Anser spp.*)
- Turkey / pulyka / dinde / peru (*Meleagris gallopavo*)
- Pigeon / galamb / pigeon / pombos (*Columbidae*)
- Horse / ló / cheval / cavalo (*Equus caballus*)
- Donkey / szamár / Âne commun / asno (*Equus asinus*)
- Mule / öszvér / mulet / mula
- Camel / teve / chameaux / camelo (*Camelus bactrianus*, *C. domedarius*)
- Llama / láma / lama / lhama
- Rabbit / nyúl / lapin / coelho-europeu (*Oryctolagus cuniculus*)
- Other rodents (e.g. guinea pig)
- Beehive / méhkaptár / ruche / colméia



Animal domestication

- Some become smaller, others larger
- They are generally less „smart”
- They should eat easily obtainable food (carnivores are generally out)
- They should grow fast (elephant out)
- They need to breed in captivity
- They should be social
- They should not have an evil temperament (zebra, zebrák, grizzly bear out)
- They should not have a strong panic reaction



Domesticated big bodied animals - worldwide

1. Sheep
2. Goat
3. Cattle
4. Pig
5. Horse



Locally domesticated animals

1. Arabian camel (*Camelus dromedarius*)
2. Bactrian camel (*Camelus bactrianus*)
3. Llama / alpaca (*Lama glama*)
4. Donkey (*Equus africanus asinus*)
5. Reindeer (*Rangifer tarandus*)
6. Water buffalo (*Bubalus bubalis*)
7. Yak (*Bos grunniens* and *Bos mutus*)
8. Banteng (*Bos javanicus*)
9. Mithan / Indian bison / gaur (*Bos gaurus*)

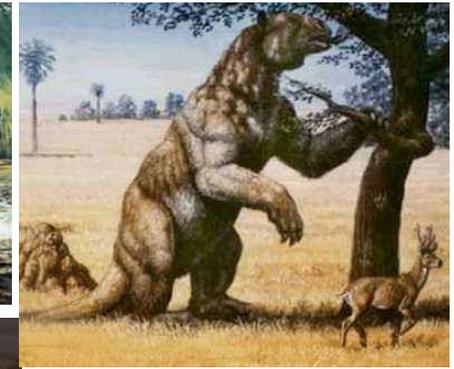


Why are other continents devoid of domesticable animals?

- Most of African large animals were already well adapted to the presence of large hunting ape. To some lesser extent it is also true for Eurasia.
- On the other continents animals were naïve and they could be hunted too easily
- Humans hunted nearly all large animals to extinction before they could try to domesticate them

North American large animals

- Mastodon, mammoth, gomphotheres, ground sloth, glyptodon, 10 species of horse, 2 tapirs, 2 pekkari, 2 llama, a camel, American cheetah, sabre-toothed tiger, Floridian cave bear, etc.





Other continents

- Humans appeared in Australia 35-50k years ago. Large animals went extinct 20-30k years ago. In the last 100k years 86% of the large animals gone extinct there.
- In South America 79% of the large bodied animals died 15-20k years ago
- In Africa “only” 17% of the large animals got extinct



Continent's shape

- Eurasia has an East-West axis, and thus plants and animal domesticated at one point could easily transported/grown to/in another place as the climate is roughly similar
- America has a South-North axis and thus all plant need to cross several climatic zones



Cultural evolution and environmental differences

- History took a different course for different people not because of their innate biological abilities, but because the differences in their environment.