

Module I

Brief Environmental History



Lecture 1 (2 July 2024)
Dr. Asib Ahmed



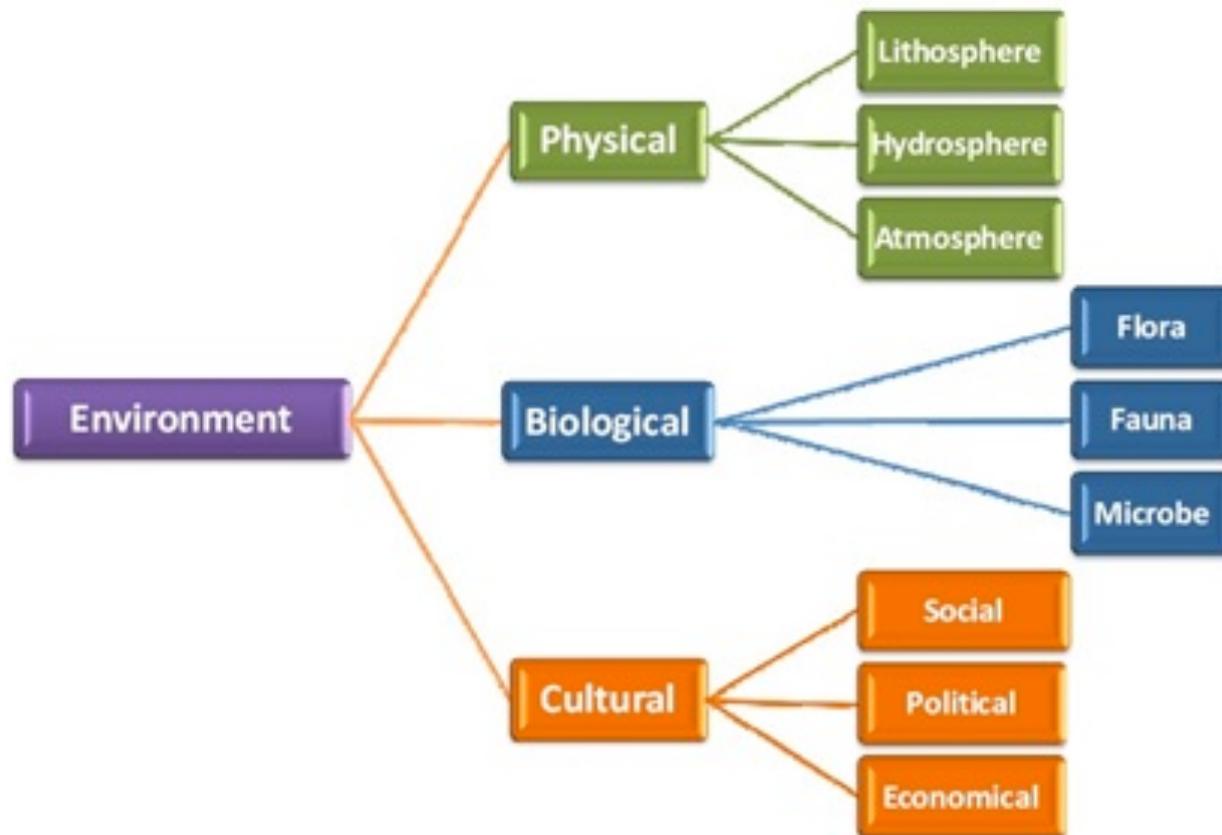
**Department of Social Relations
EAST WEST UNIVERSITY**

Defining Environment

- ✓ From the French word '*environner*' - to encircle or surround
- ✓ The surroundings or conditions in which a person, animal, or plant lives or operates.
- ✓ The natural world, as a whole or in a particular geographical area, especially as affected by human activity.
- ✓ The circumstances and conditions that surround an organism or group of organisms.
- ✓ The complex of physical, chemical, and biotic factors (such as climate, soil, and living things)

Components of Environment

- Physico-chemical: lithosphere, hydrosphere, atmosphere
- Biological: flora, fauna, microbe
- Human/cultural: social, political, economical



Types of Environment (Based on components)

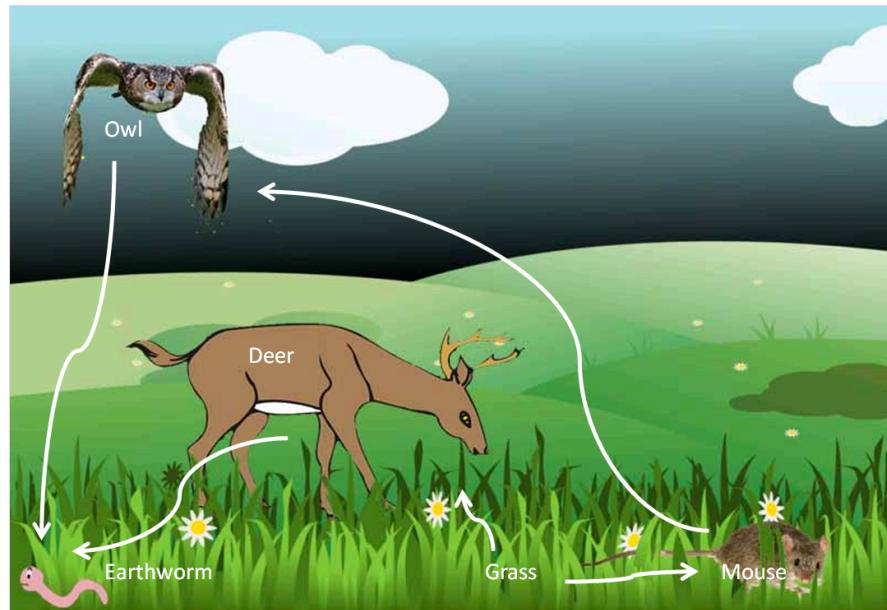
Biotic: any living component that affects another organism or shapes the ecosystem.

Examples of biotic factors include:

Grass as **producers** (autotrophs).

Mouse, deer, and owl as **consumers** (heterotrophs).

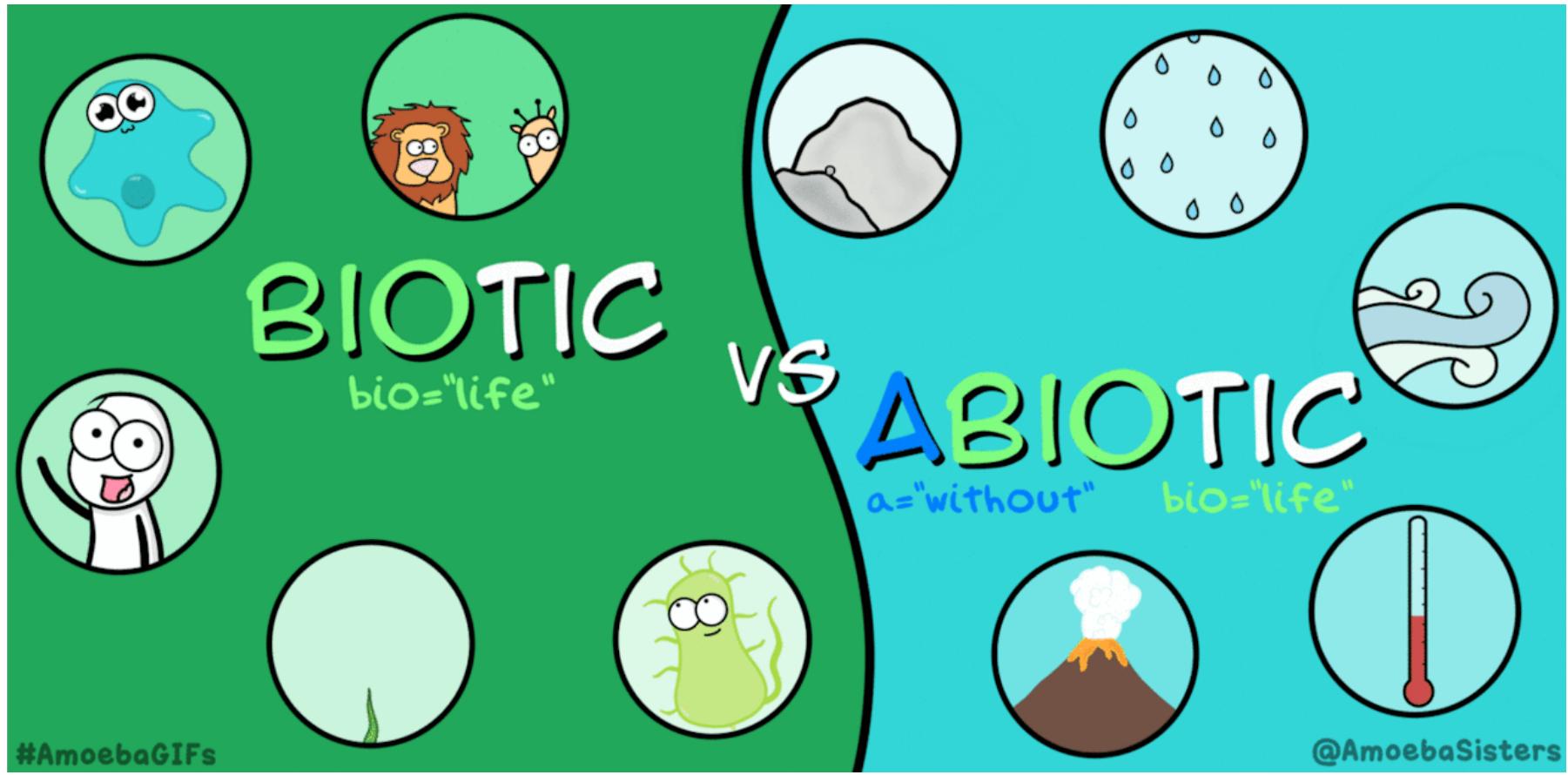
Earthworms as **decomposers** (detritivores).



Abiotic: all the non-living factors and processes in an ecosystem.

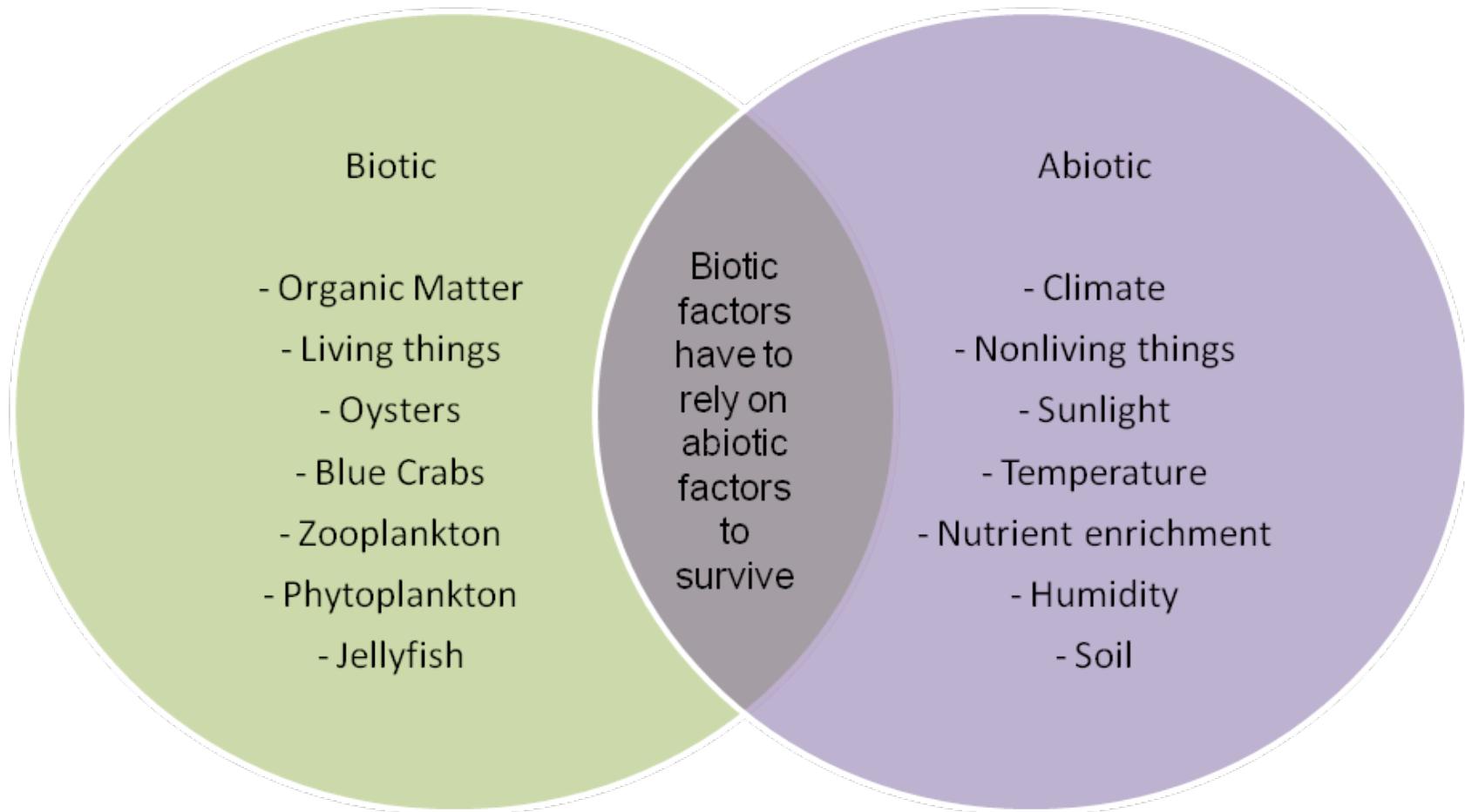
Sunlight, soil (with its parameters-such as acidity), water, wind, humidity, for example, are all important abiotic factors that interact with each other and affect living organisms – including animals and plants.





#AmoebaGIFs

@AmoebaSisters



Environment may also refer to:

- **Natural environment**: all living and non-living things that occur naturally on Earth.
- **Built environment**: constructed surroundings that provide the setting for human activity, ranging from the large-scale civic surroundings to the personal places.
- **Social environment**: the culture that an individual lives in, and the people and institutions with whom they interact.

Environmental History

Environmental history deals with the history of human impacts on nature and the interactions between humans and nature.

It asks how nature influences humans, how humans intervene in nature and how nature and humans interact.

Environmental history offers an earth's-eye view of the past.

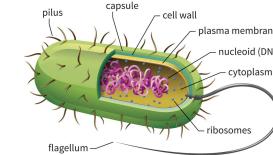
It addresses the many ways in which human beings have interacted with the natural environment over time. As one of the newest perspectives within the discipline of history, it is a field that is still in the process of self-definition.

History of the Earth

4.65 billion years ago: Earth is formed

4 billion years ago: The first life on Earth was simple, prokaryotic bacteria.

600 million years ago: Aquatic plants and animals evolved.

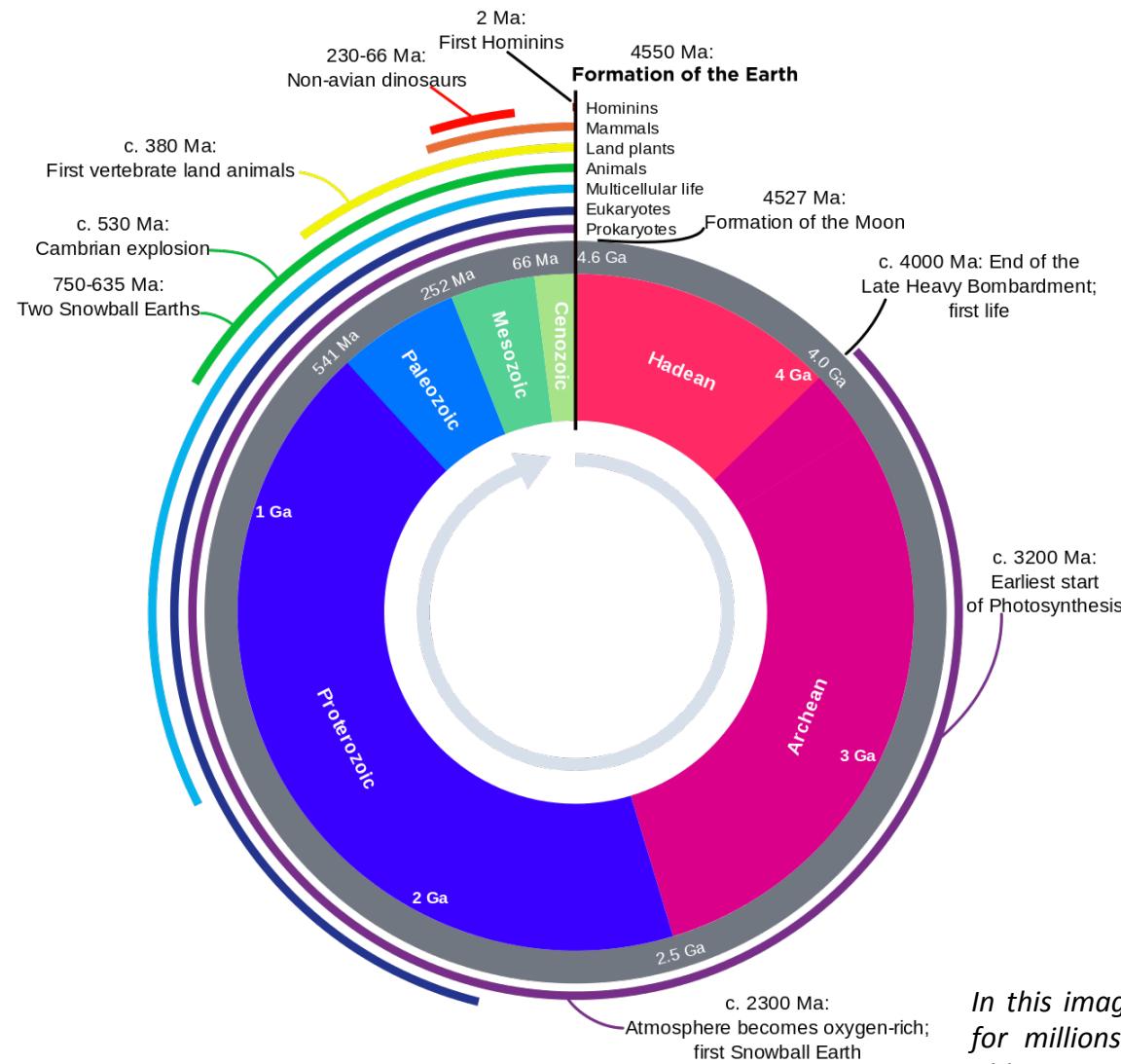


500 million years ago: Huge period of evolution and diversification of life known as the Cambrian Period.

400 million years ago: Terrestrial plants and animals evolved.

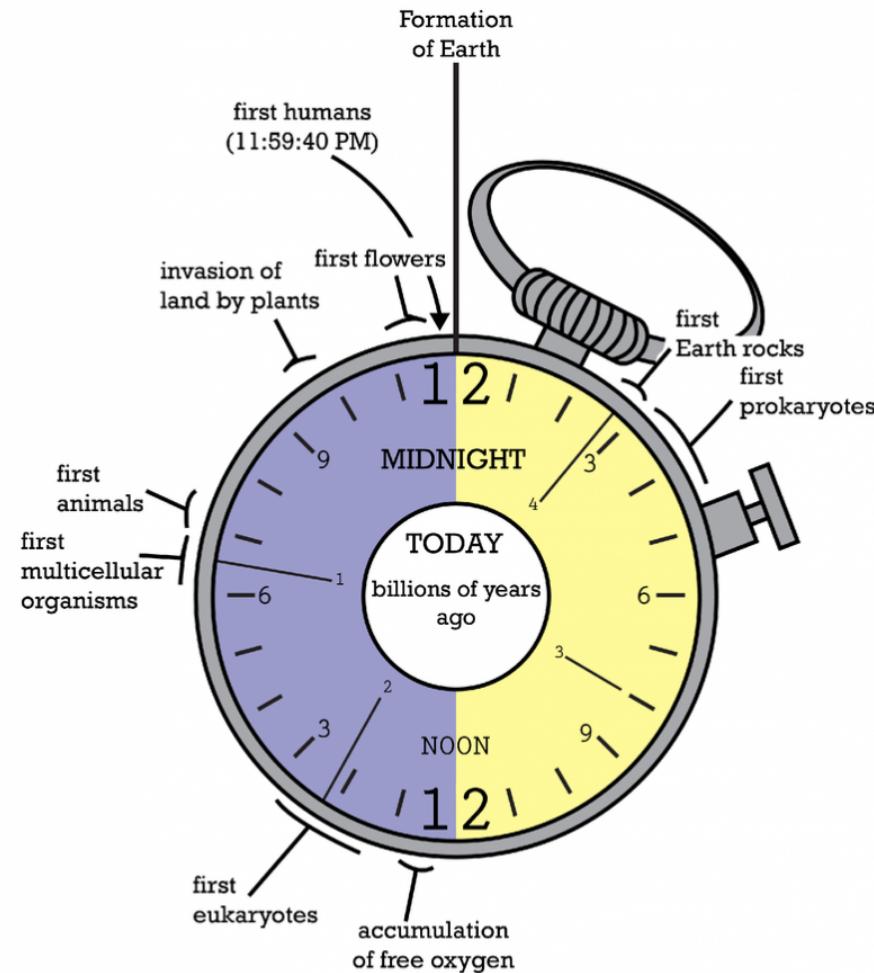
65-250 million years ago: Dinosaurs lived during the Mesozoic Era.

200,00-300,000 years ago: Homo sapiens, early ancestors of humans, evolved.



In this image, Ma is an abbreviation for millions of years and Ga is an abbreviation for billions of years.

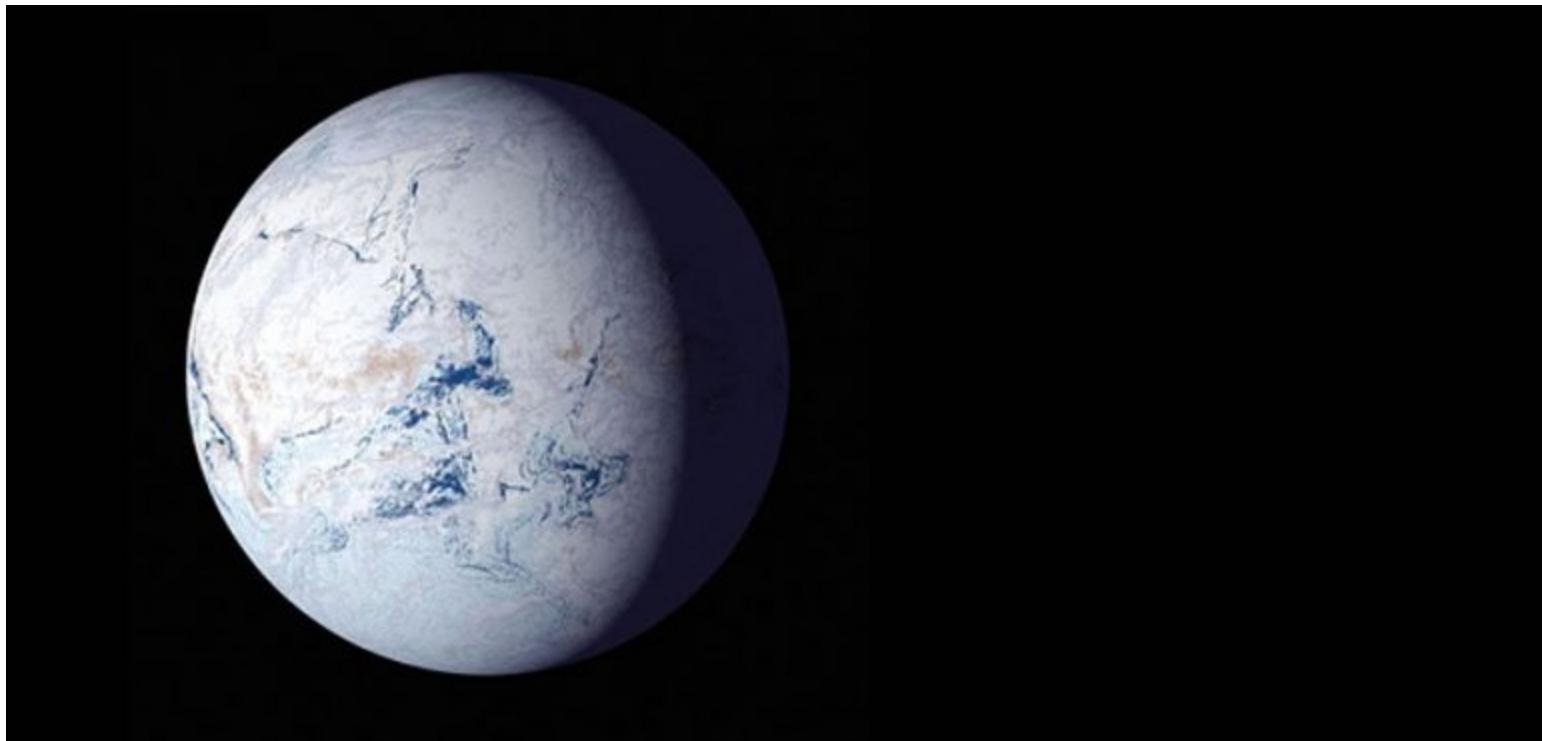
If the entirety of Earth's history was represented on a clock, humans would appear at 11:59:40 PM!!



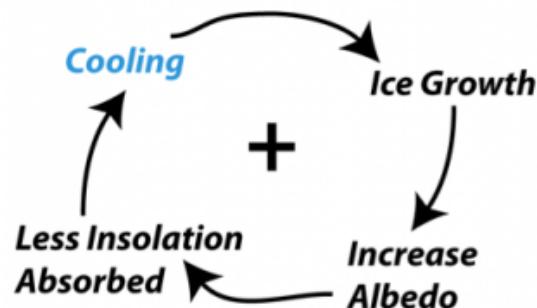
Earth's history projected
on a 24-hour day

Snowball Earth

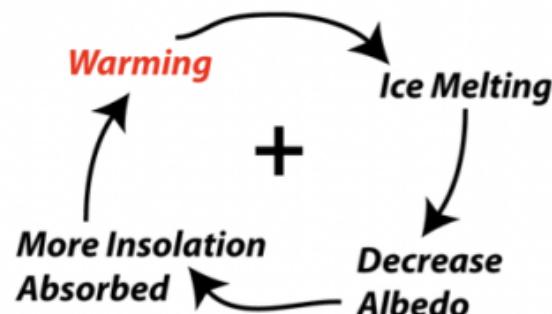
At least three times in Earth's history, the planet was engulfed almost entirely in ice—an event called Snowball Earth. These events happened between 580 and 750 million years ago.



Snowball Earth was caused by a chain of events called a positive feedback loop. Ice has a high albedo and is very insulating, so it is not heated up efficiently by sunlight.



Why is Earth not covered in ice now if the positive feedback loop continues forever? The leading theory is that volcanoes continued erupting during Snowball Earth, emitting high levels of carbon dioxide, which was trapped under the ice.



Theories on Various Tectonic Aspects of the Earth

Wegner's Continental Drift Theory

Plate Tectonic Theory

Continental Drift Theory

Continental Drift Theory was put forward by German scientist **Alfred Wegner** in 1915.

According to the Continental Drift Theory, part of the crust are capable of moving horizontally round the globe causing the continents to slowly change their positions in relation to one another.

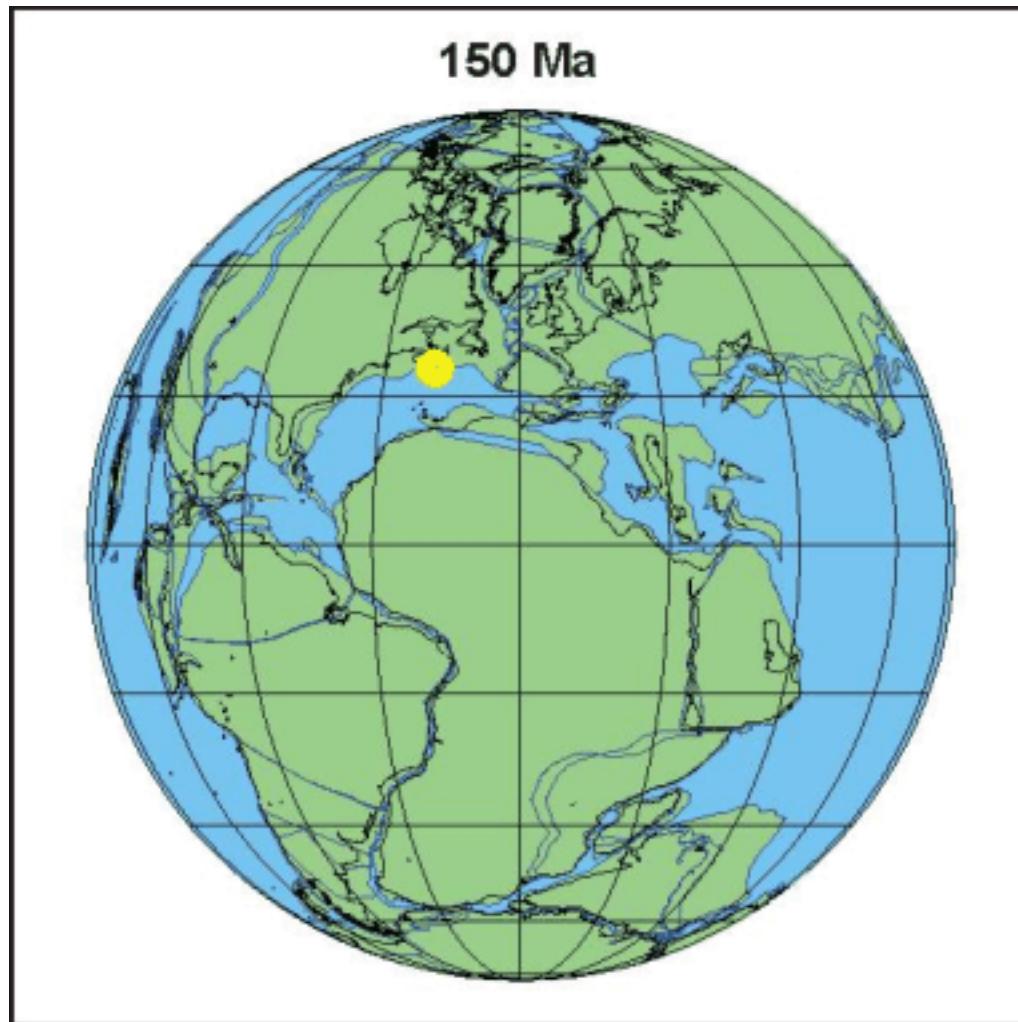
The fact that South America is a mirror image of Africa is presented as a proof of the continental drift theory.

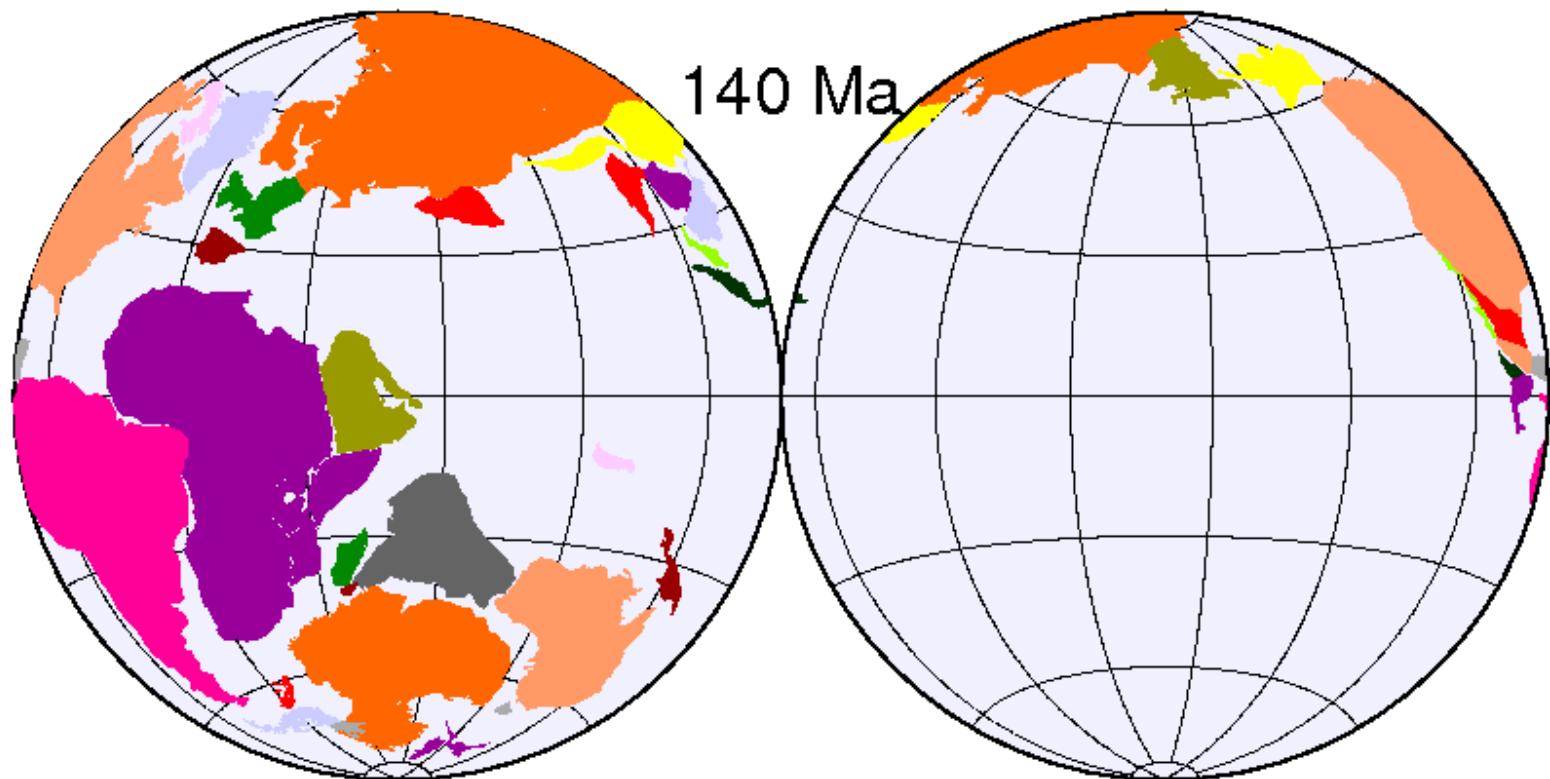
For **hundreds of millions of years**, all the land of Earth was joined together in one large mass or super continent. Scientists call it **Pangaea** (meaning “all lands” in Greek).

Then about **200 million years** ago the land began to drift apart. It broke into two pieces, and scientists have called the continent in the north **Laurasia** and the continent in the south **Gondwanaland** (named by Eduard Suess, an Austrian geologist).

The two large continents continued to break apart into the smaller continents that exist today. Scientists call this movement '**continental drift**'.







Continental Drift

225 million years ago





225 million years ago



150 million years ago



100 million years ago



Earth today

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Forces responsible for drifting of continents (According to Alfred Wegener)

According to Wegener, the drift was in two directions:

1. **Towards the equator** due to the interaction of **forces of gravity, pole-fleeing force** (due to centrifugal force caused by earth's rotation) and **buoyancy** (*ship floats in water due to buoyant force offered by water*)
2. **Westwards** due to **tidal currents** because of the earth's motion (earth rotates from west to east, so tidal currents act from east to west, according to Wegener).

Wegener suggested that **tidal force** (gravitational pull of the moon and to a lesser extent, the sun) also played a major role.

The polar-fleeing force relates to the rotation of the earth. Earth is not a perfect sphere; it has a bulge at the equator. This bulge is due to the rotation of the earth (greater centrifugal force at the equator).

Centrifugal force increases as we move from poles towards the equator. This increase in centrifugal force has led to pole fleeing, according to Wegener.

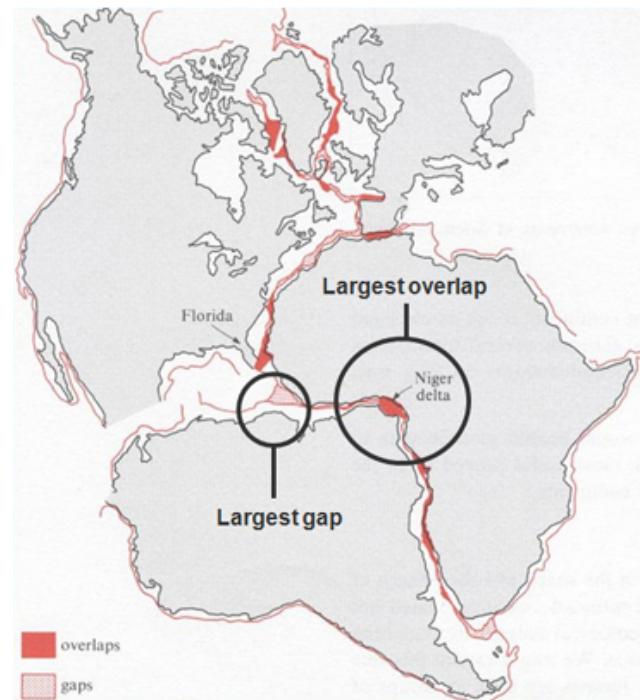
Tidal force is due to the attraction of the moon and the sun that develops tides in oceanic waters.

According to Wegener, these forces would become effective when applied over many million years, and the drift is continuing.

The evidences in support of the continental drift theory:

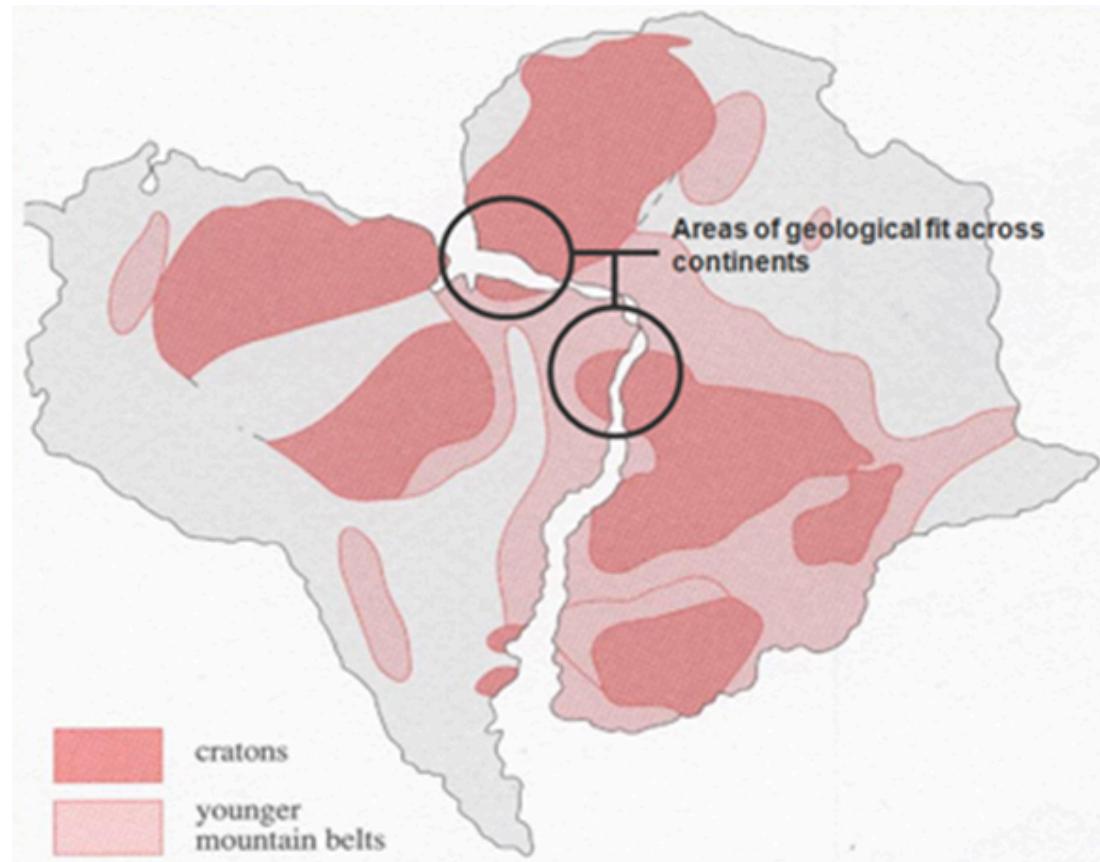
1. Jigsaw Fit:

The similarity in outline of the coastlines of eastern South America and West Africa had been noted for some time. The best fit is obtained if the coastlines are matched at a depth of 1,000 meters below current sea level.



2. Geological Fit:

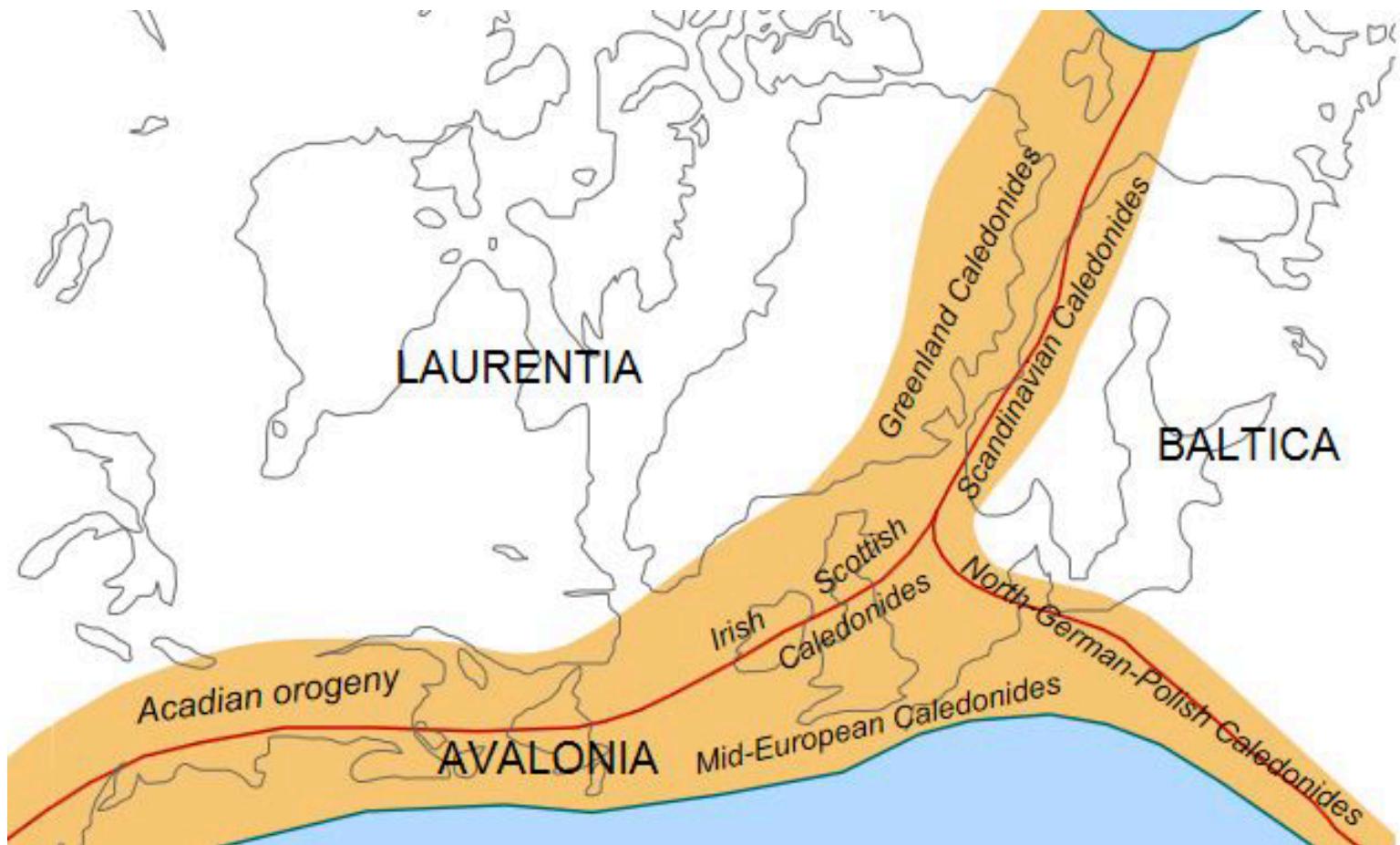
When the geology of eastern South America and West Africa was mapped it revealed that ancient rock outcrops (cratons) over 2,000 million years old were continuous from one continent to the other.



3. Tectonic Fit:

Fragments of an old fold mountain belt between 450 and 400 million years ago are found on widely separated continents today.

Pieces of the Caledonian fold mountain belt are found in Greenland, Canada, Ireland, England, Scotland and Scandinavia. When these land masses are re-assembled the mountain belt forms a continuous linear feature.

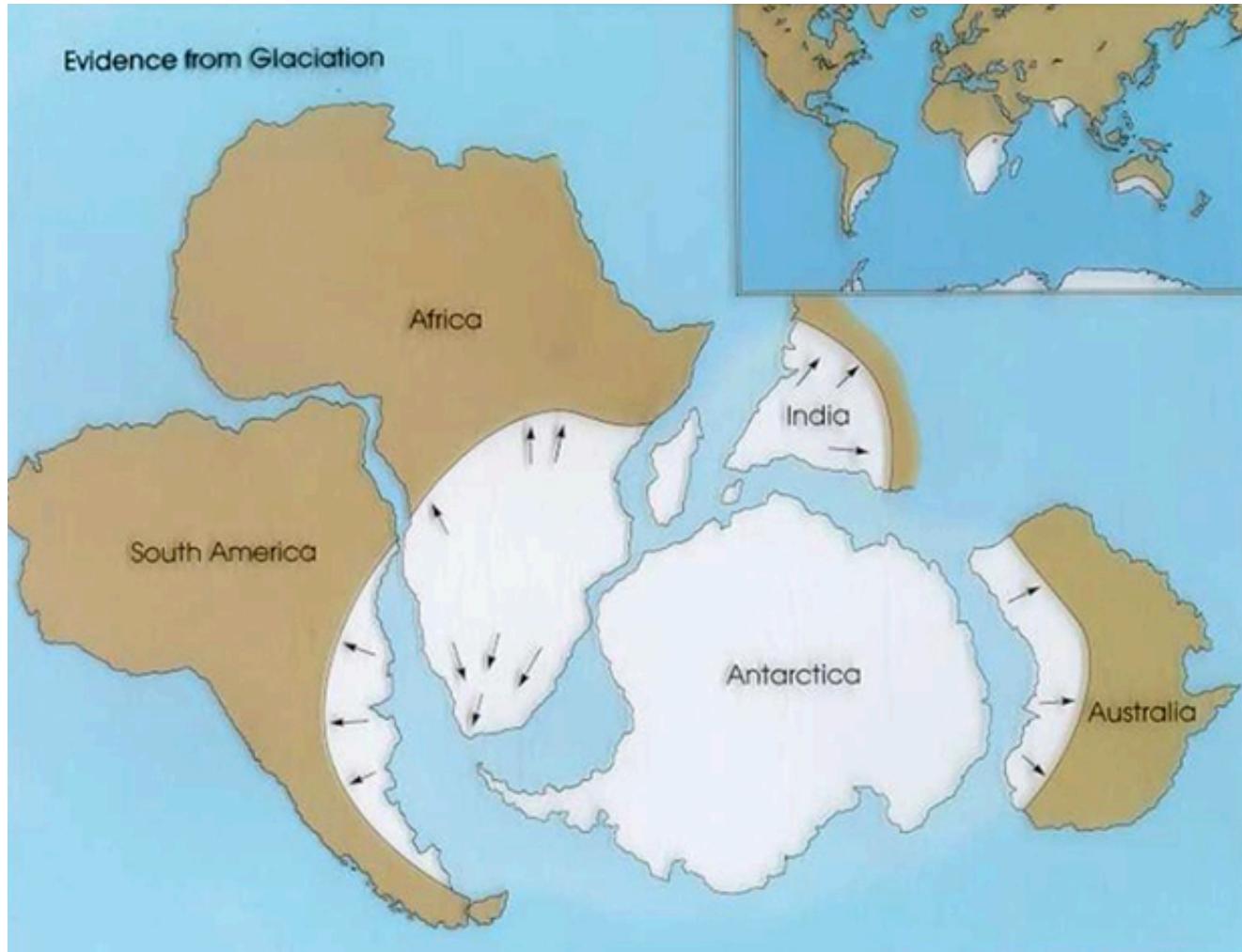


4. Glacial Deposits:

Today, glacial deposits formed during the Permo-Carboniferous glaciation (about 300 million years ago) are found in Antarctica, Africa, South America, India and Australia.

If the continents haven't moved, then this would suggest an ice sheet extended from the South Pole to the equator at this time – which is unlikely as the UK at this time was also close to the equator and has extensive coal and limestone deposits.

If the continents of the southern hemisphere are re-assembled near the South Pole, then the Permo-Carboniferous ice sheet assumes a much more reasonable size

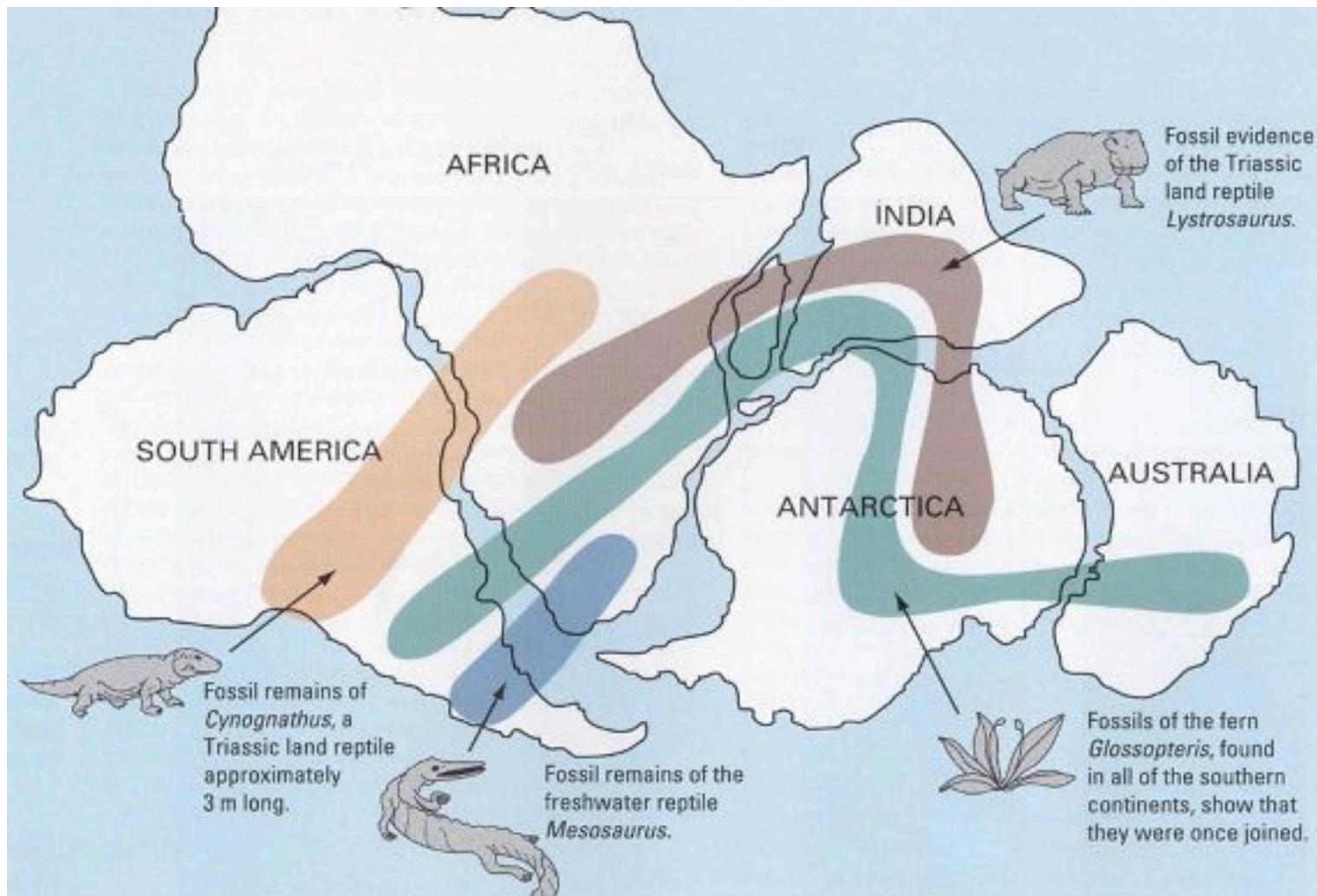


5. Fossil Evidence:

There are many examples of fossils found on separate continents and nowhere else, suggesting the continents were once joined. If Continental Drift had not occurred, the alternative explanations would be:

The species evolved independently on separate continents – contradicting Darwin's theory of evolution.

They swam to the other continent/s in breeding pairs to establish a second population.



Criticism faced by Continental Drift Theory:

Wegener failed to explain why the drift began only in Mesozoic era and not before.

The theory doesn't consider oceans.

Proofs heavily depend on assumptions that are generalist.

Forces such as buoyancy, tidal currents and gravity are too weak to be able to move continents.

Modern theories (Plate Tectonics) accept the existence of Pangaea and related landmasses but give a very different explanation to the causes of drift.

Three important revolutions shaped the course of environmental history:

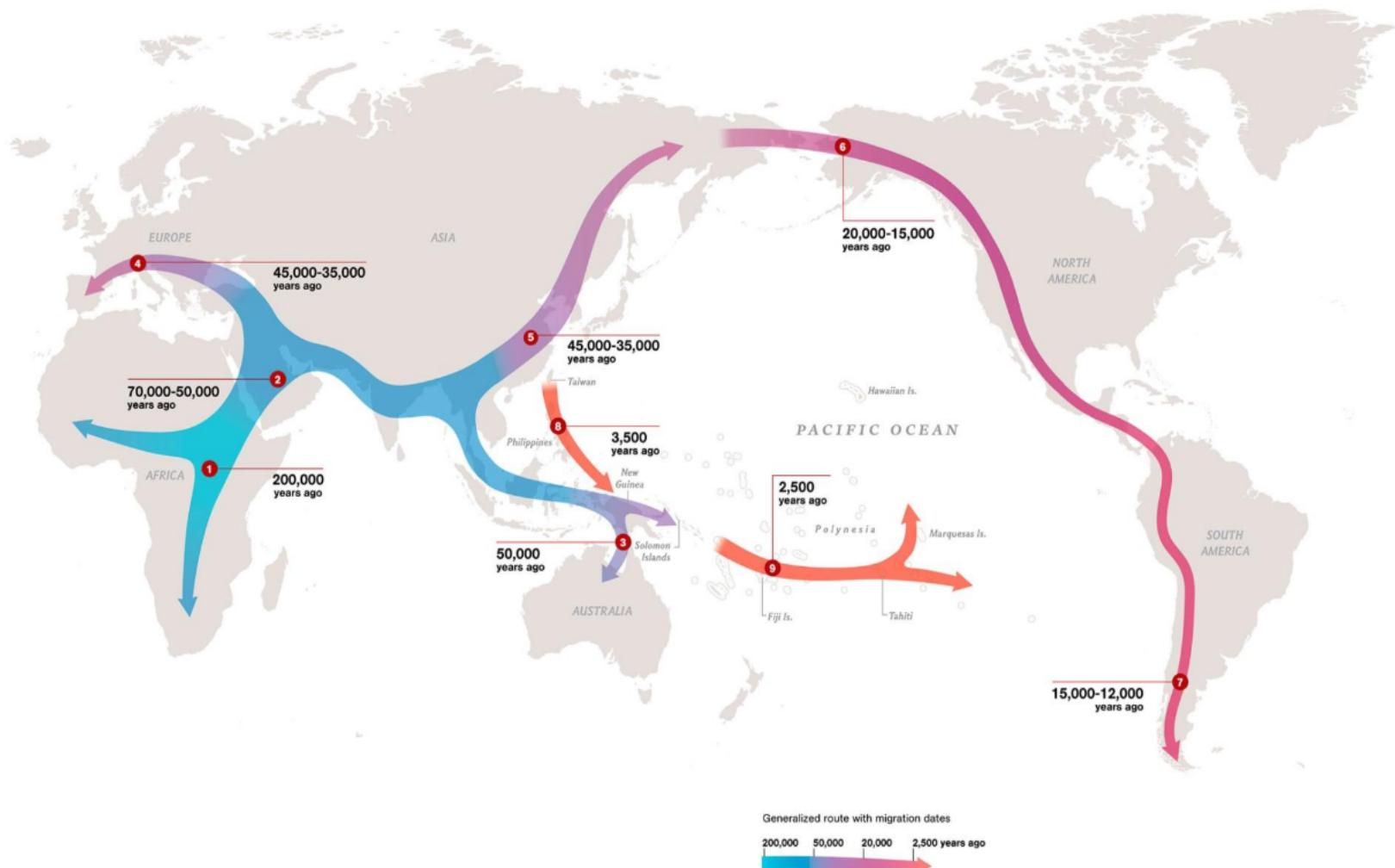
1. The Cognitive Revolution kick-started history about 70,000 years ago.
2. The Agricultural Revolution sped it up about 12,000 years ago.
3. The Scientific Revolution, which got under way only 500 years ago

Hunters and Gatherers Society & Early Human Migration

Early humans are thought to have migrated from Africa to Asia either across a strait that lies between the Horn of Africa and what is now Yemen, or via the Sinai Peninsula.

After spreading to southeast Asia, early humans are thought to have migrated to Australia, which shared a landmass with New Guinea at the time, then to Europe, then to the Americas.

Early Human Migration



On the origin of modern humans: Asian perspectives / Science (sciencemag.org):
<https://science.sciencemag.org/content/358/6368/eaai9067>

Cause of Earliest Human Migration: (*It is uncertain*)

- 1. Climate Change**
- 2. Food shortage and availability**



The first stage of human interaction with fire, perhaps as early as 1.5 million years ago in Africa, is likely to have been opportunistic.

2nd stage, use of flints to start fire: 40,000 years ago.

Third stage, 7,000 years ago: Humans began to use and control fire on a regular and widespread basis

What are the impacts of invention and use of fire?

The impacts of invention and use of fire on Environment and Society during the early human history

- a. Frighten off predatory animals and insects away.
- b. Cooking killed germs and parasites that infested food.
- c. Far easier chewing and digesting
- d. Less time for eating
- e. Smaller teeth, shorter intestines, growth of the human brain.
- f. With smarter brains, we got better at hunting and foraging
- g. Cleared areas around cave for better safety
- h. Changed power dynamics between human and ecosystem

12,000 Years Ago [9500–8500 BC]



12,000 Years Ago [9500–8500 BC]



The transition to agriculture began around 9500–8500 BC in the hill country of south-eastern Turkey, western Iran, and the Levant



The Rise and Spread of Food Production

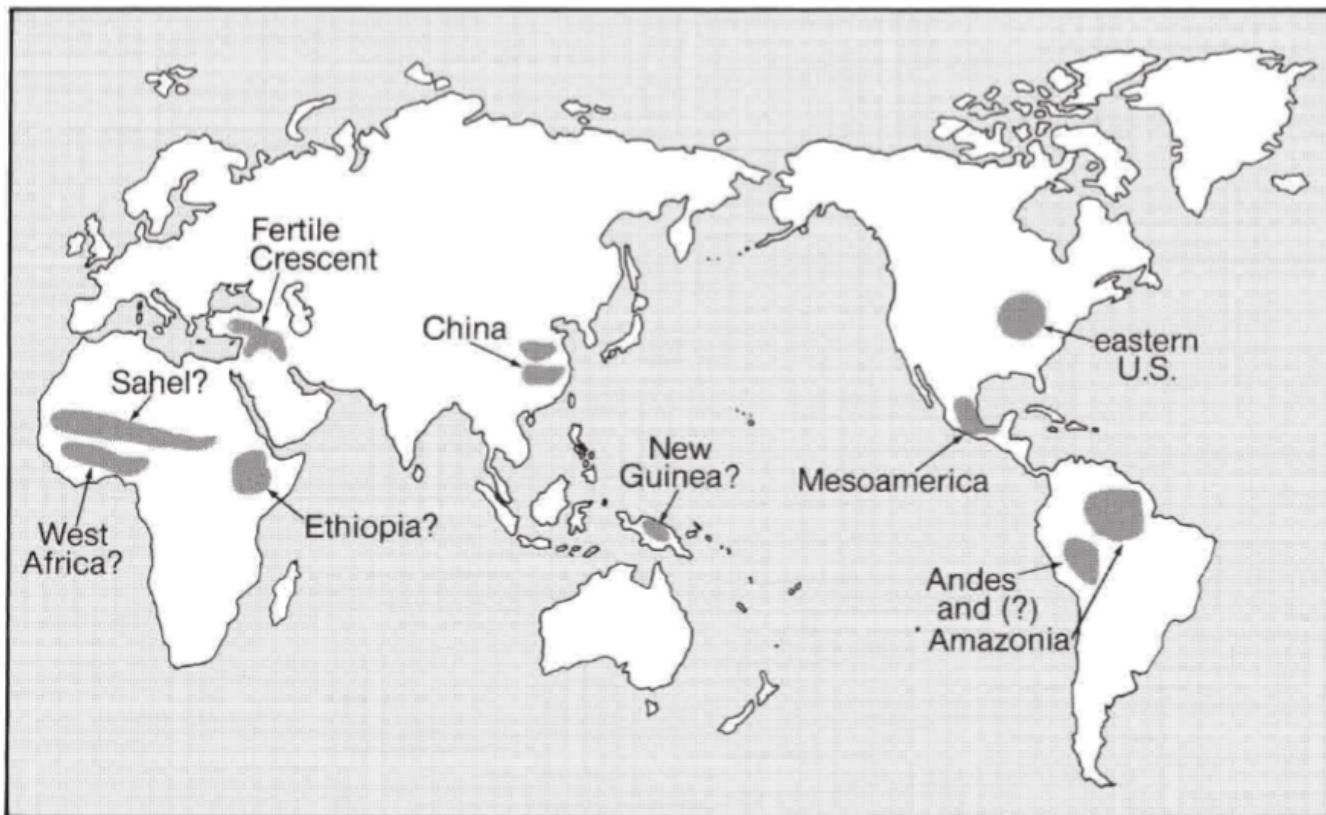


Figure 5.1. Centers of origin of food production. A question mark indicates some uncertainty whether the rise of food production at that center was really uninfluenced by the spread of food production from other centers, or (in the case of New Guinea) what the earliest crops were.

Why did agricultural revolutions erupt in the Middle East, China and Central America but not in Australia, Alaska or South Africa?

The reason is simple: most species of plants and animals can't be domesticated. Sapiens could dig up delicious truffles and hunt down woolly mammoths, but domesticating either species was out of the question. The fungi were far too elusive, the giant beasts too ferocious.

Of the thousands of species that our ancestors hunted and gathered, only a few were suitable candidates for farming and herding. Those few species lived in particular places, and those are the places where agricultural revolutions occurred.

Sapiens A Brief History of Humankind Book by Yuval Noah Harari

The impacts of Agriculture and Animal Domestication on Environment and Human Society?

Produced much more food per unit of territory, and thereby population exploded

The new agricultural tasks demanded so much time that people were forced to settle

permanently next to their wheat fields. This completely changed their way of life.

Village life brought some immediate benefits, such as better protection against wild animals, rain and cold.

Selective hunting and breeding of animals. The result was a herd of domesticated and submissive animals.

Exchange of Germs (animal-derived, density, human waste, trade)

These plants domesticated Homo sapiens, rather than vice versa

The impacts of Agriculture and Animal Domestication on Environment and Human Society?

Village, tribe were formed and made pathways for further development of civilization. Not everyone needed to farm. People could specialise in making tools, building houses, smelting metals or, for that matter, telling other people what to do.

It was the foundation of large-scale political and social systems. Everywhere, rulers and elites sprang up, living off the peasants' surplus food and leaving them with only a bare subsistence. These forfeited food surpluses fueled politics, wars, art and philosophy. A completely new type of information became vital – numbers.

Between the years 3500 BC and 3000 BC, some unknown Sumerian geniuses invented a system for storing and processing information outside their brains, one that was custom-built to handle large amounts of mathematical data. The Sumerians thereby released their social order from the limitations of the human brain, opening the way for the appearance of cities, kingdoms and empires. The data-processing system invented by the Sumerians is called 'writing'.

9500 Years Ago



First Large Urban Settlement In Anatolia, Turkey: A very large settlement in southern Anatolia of Turkey existed from approximately 7500 BC to 5700 BC. It flourished around 7000 BC and is regarded as the largest and best-preserved Neolithic site found to date.

8000 - 6500 Years Ago

Extensive Farming with Large Scale Ecological Effects: Within a few thousand years of its inception, farming was all over Europe and Asia — benefiting societies, but **not without decimating ecosystems (e.g. deforestation)**



3,500 Years Ago



1543 – 1684 AD

The scientific revolution was the emergence of modern science, when developments in mathematics, physics, astronomy, biology (including human anatomy) and chemistry transformed views of society and nature.

The Great Acceleration

Human activity, predominantly the global economic system, is now the prime driver of change in the Earth System — the sum of our planet's interacting physical, chemical, biological and human processes.

Since the 1950s the influence of human activity on the Earth system has increased noticeably. This '**Great Acceleration**' is marked by a **major expansion in human population**, large changes in natural processes and the **development of novel materials** from minerals to plastics to persistent organic pollutants and inorganic compounds.

Human and cultural evolution on Earth

1.5 million years ago	Use of fire in Africa
40,000 YA	Use of flints to start fire
11,000 YA	Origin of farming/ agriculture in southwest Asia
11,000 to 9000 YA	Domestication of animal
9500 YA	First large urban settlement in Anatolia, Turkey
8000 YA	Extensive farming with large scale ecological effects
6500 YA	Rice Production with large ecological effects
3500 YA	Invention of wheels (in Mesopotamia)
3,000 to 500 YA	Anthropogenic soils: Earth's soils had begun showing signs of human wear-and-tear, including widespread phosphorus leftover from fertilizer.

1439 ad	Beginning of the Printing Revolution (Gutenberg press)
1492 – 1800 ad	New- Old world collision
1543 – 1684 ad	Scientific revolution
1678 ad	Coal as a major source of energy
1798 – 1765 ad	Steam engine: Thomas Newcomen invented the first commercial steam engine using pistons, primarily used for mine pumping.
1760 ad	Industrial revolution: Large-scale combustion of coal, oil, and gas enables the transition to new manufacturing processes, from manual to mechanical.
1804 ad	World population reaches 1 billion
1909 ad	Haber-Bosch process: Allowed the conversion of atmospheric nitrogen to ammonia for use as fertilizer, and allowed greater intensification of agriculture and supporting two billion more people by some estimates.
1914-1918 ad	World War I
1939 -1945 ad	World War II
1950 ad	The great acceleration



Thank You!

