

Water, Life, Humans, and Civilization

The First Organisms

Must survive in low-oxygen environments
Could not eat other organisms for food

Assemble complex carbon compounds from simple Carbon compounds (CO₂) using external energy.

Two energy sources: Light and Chemical reactions


Light: photoautotrophs
Chemical reactions: chemoautotrophs

The First Organisms

Light: photoautotrophs
Chemical reactions: chemoautotrophs

The First organisms: Chemoautotrophs (Fe and S)

Evidence: microtubes in pillow lavas containing residual carbon



The Early Organisms

Must survive in low-oxygen environments
Could not eat other organisms for food

Photosynthesizers: photoautotrophs

Earliest: Blue-green algae/cyanobacteria

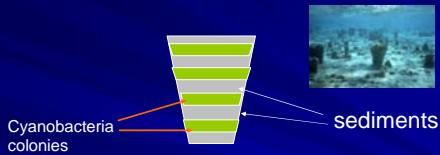


Main effects:

- Removal of carbon dioxide
- production of oxygen

The Early Organisms

Oldest macroscopic life: stromatolites



Produced billions of tons of O₂

No immediate increase in atmospheric O₂

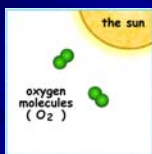
Stromatolites → Oxygen → O₂ combined with iron

Colonization of land:

Ozone Layer

Ozone Function:

Screens harmful UV radiation



First land plants 480 mya

Skipping Ahead

Reptiles ~ 245 million years ago

Mammals ~65 million years ago

Primates ~30 million years ago

Pre-humans ~5-8 million years ago
(hominids)

Homo sapiens ~200,000 years ago

Human Taxonomy

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Primata

Family: **Hominidae** → Hominids

Genus: *Homo* distinct adaptations which may have led to the development of the human species.

Species: *sapiens*



Lucy

Age: 3.2 million years

Family: hominidae

Genus/Species: Australopithecus Afarensis

"The earliest celebrity"



Innovation: **Walking upright**

lead to further anatomical progression

Why Stand Up?



Hypotheses

Postural Feeding Hypothesis

Thermoregulatory Model

Wading Hypothesis

Savanna Hypothesis



Savanna Hypothesis

Uplift of the Himalayas altered the climate in Africa

Lowered rainfall reduced African vegetation

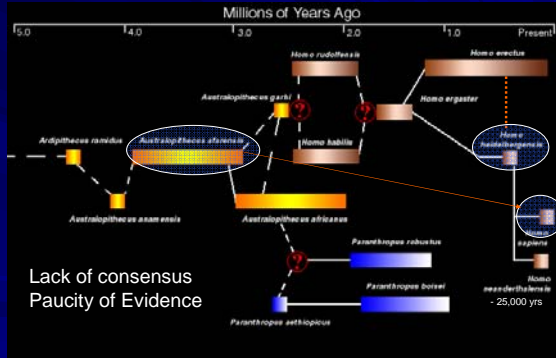
Distance between trees increased

Hominids forced to spend more time on the ground

Hominids developed the advantage of walking upright

Bipedalism lead to further anatomical progression

Evolutionary Timeline



Scarcity of Fossil Evidence



Homo sapiens are the only species to develop civilizations

Water and the Development of Human Civilization

Civilization

- the settlement of people upon an area continuously cultivated and possessed, who live in buildings continuously inhabited with a common rule and economy, a common city, citadel or temple and, in some cases, a military and the development of writing.

Possession
Habitation
Economy
Citadel/Temple
Military
Writing

Civilization

The **first** condition necessary to the settling of humans.

A trustworthy supply of water

Earliest Civilizations and Water

1. Sumer/Mesopotamia

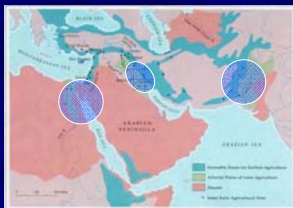
Egypt

Indus Valley

Tigris-Euphrates rivers

Nile river

Indus river



Developments
Irrigation, cities, art,
architecture, writing

Civilization: Before and After

Development

Paleolithic (old stone age)
was the first period in the development of human technology of the Stone Age.

-2 million years
↓
-12,000 years

Homo habilis



Stone Tools

Development

Neolithic (new stone age)
was a period in the development of human technology that is traditionally the last part of the Stone Age

-12,000 - -3500 years

- Domestication
- Pottery
- Weaving
- Hafted Axes



Cause of the change?

Agriculture

20,000 years ago

Development
Of Agriculture
(systematic/irrigated)


8,000 years ago

Development was slow and variable

Neolithic Revolution

food gatherers to food producers

- ✓ Fewer Farmers
- ✓ Surplus Food

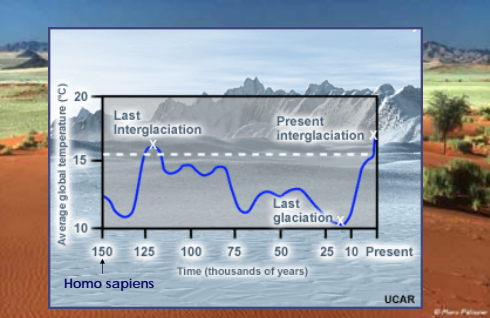


Craftsmen
Traders
Technicians

Specialized skills
Diverse abilities

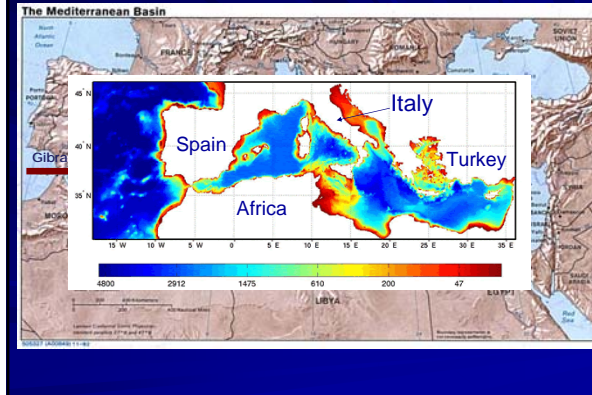
Why Then?

Forced Adaptation



The graph shows average global temperature in degrees Celsius over the last 150,000 years. The y-axis ranges from 10 to 20°C. The x-axis shows time in thousands of years from 150 to Present. Key periods are labeled: Last Interglaciation (around 125,000 years ago), Last glaciation (around 20,000 years ago), and Present interglaciation (from 10,000 years ago to Present). A vertical line at 150,000 years ago marks the arrival of Homo sapiens. The UCAR logo is in the bottom right corner.

Retreat of the Ice



Consequences

- Overpopulation of lands around the Mediterranean
- Concentration of people into smaller areas
- Overload of available resources
 - ✓ depletion of plants
 - ✓ Animal populations died back
- new survival strategies
 - ✓ till the earth
 - ✓ Pooled resources
 - ✓ Protect/domesticate animals

Egypt and Mesopotamia



Nile
Jordan
Tigris
Euphrates

Neolithic founder crops
Wheat
Barley
Flax
Chick Pea
Lentil

Domesticated animals:
cows, goats, sheep, and pigs

Time Perspective

tool users	2,000,000 yrs
agriculture	8,500 yrs
iron age	3,000 yrs
industrial revolution	
The Model T	61 years
Moon landing	

Miscellaneous

Vinyl	1926
Saran Wrap	1953
Velcro	1955
Plastic Garbage Bags	1968

Caller ID patented 1982
First soft drinks in all-aluminum cans 1964

Life, Humans, Civilization, and Water

Next: What's So Special About Water?
