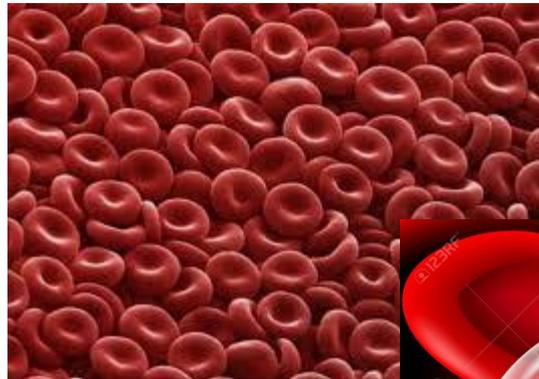




GENERAL BIOLOGY CURS1

HUMAN COMPLEXITY



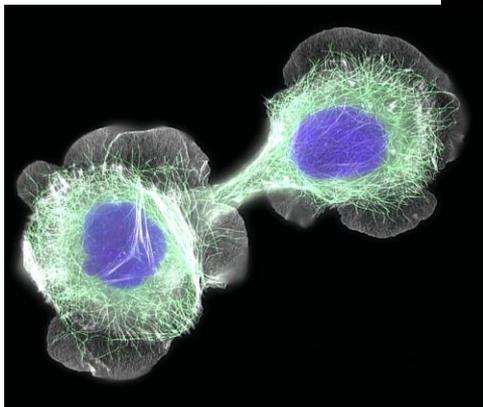
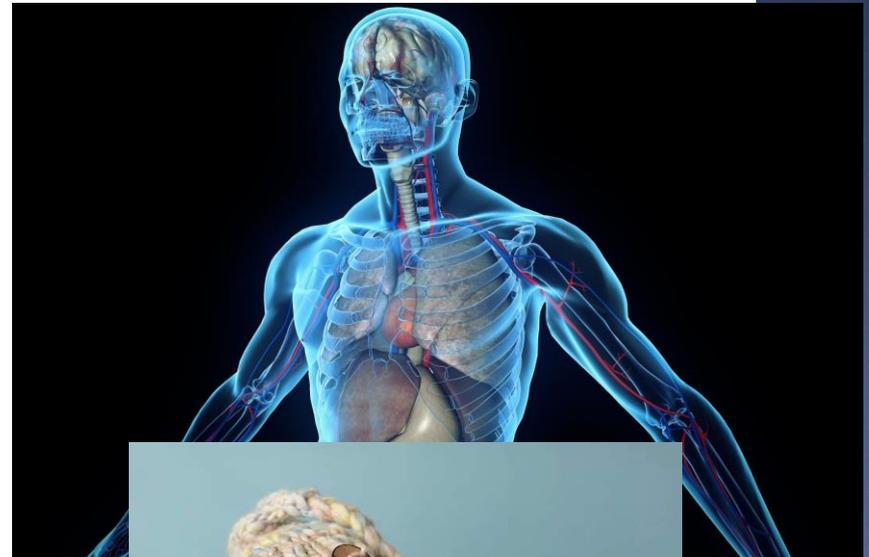
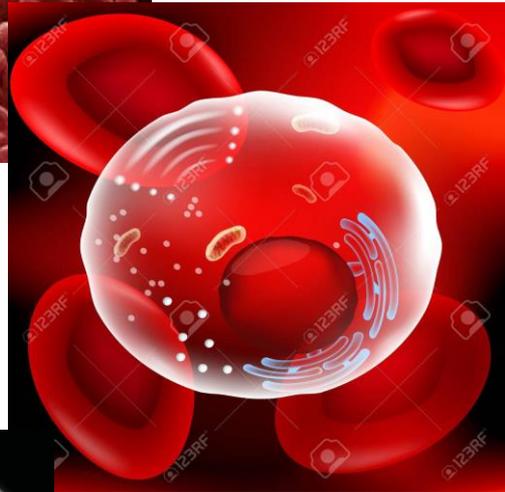
cancer

atherosclerosis

diabetes

antibiotic resistance

aging



allergies

coronary disease



Mechanical part

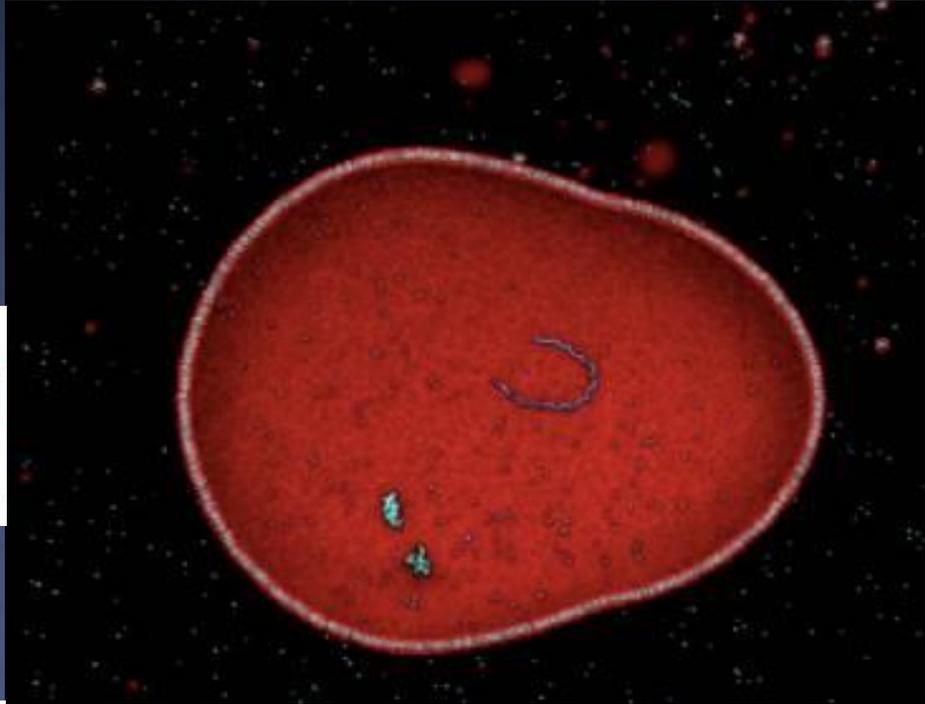
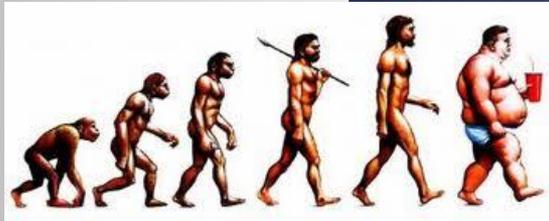


Engineering

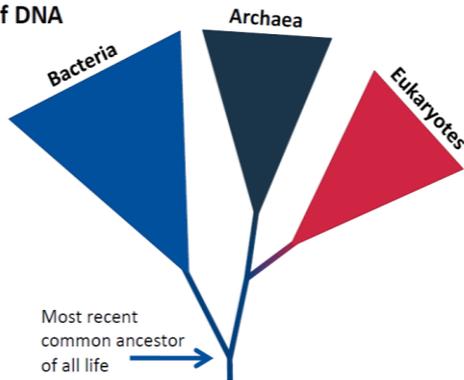


ORIGIN

OF LIFE

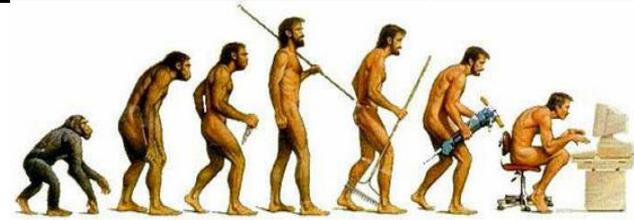


Evolutionary continuity of DNA

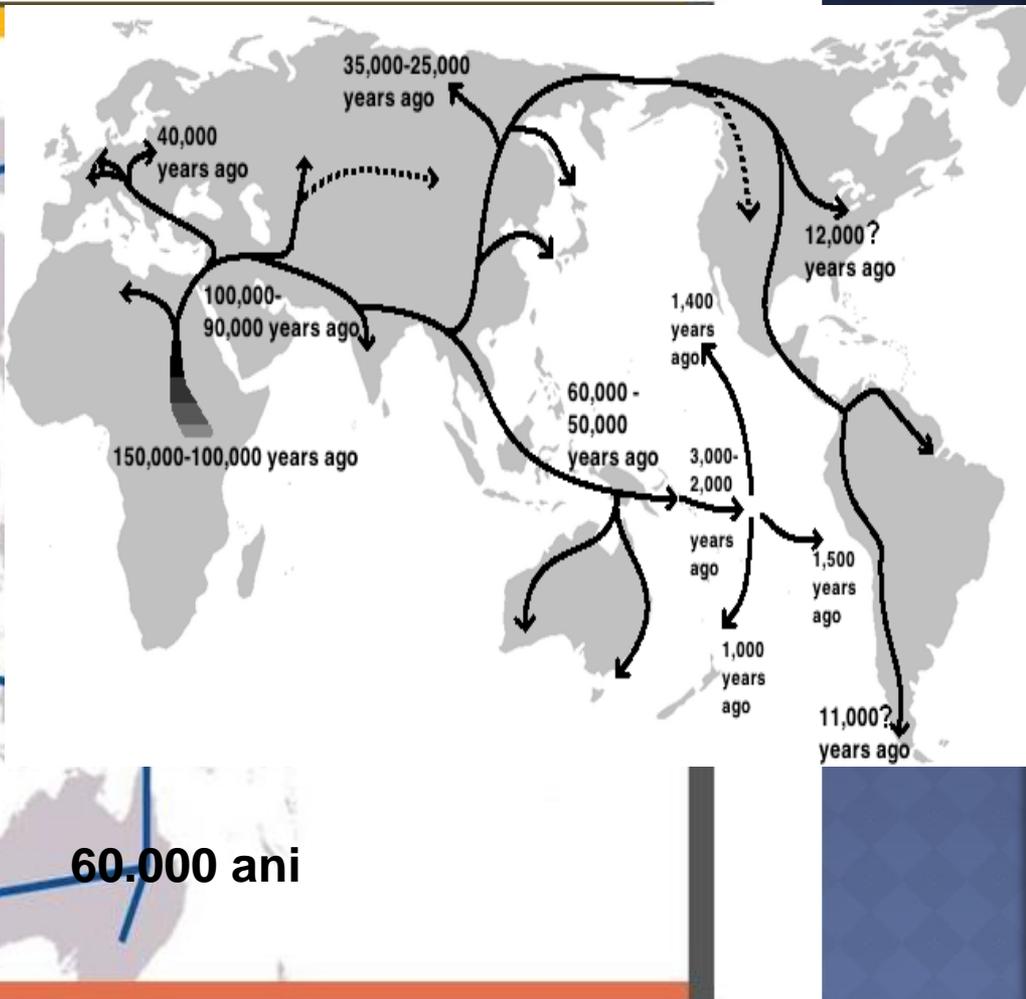
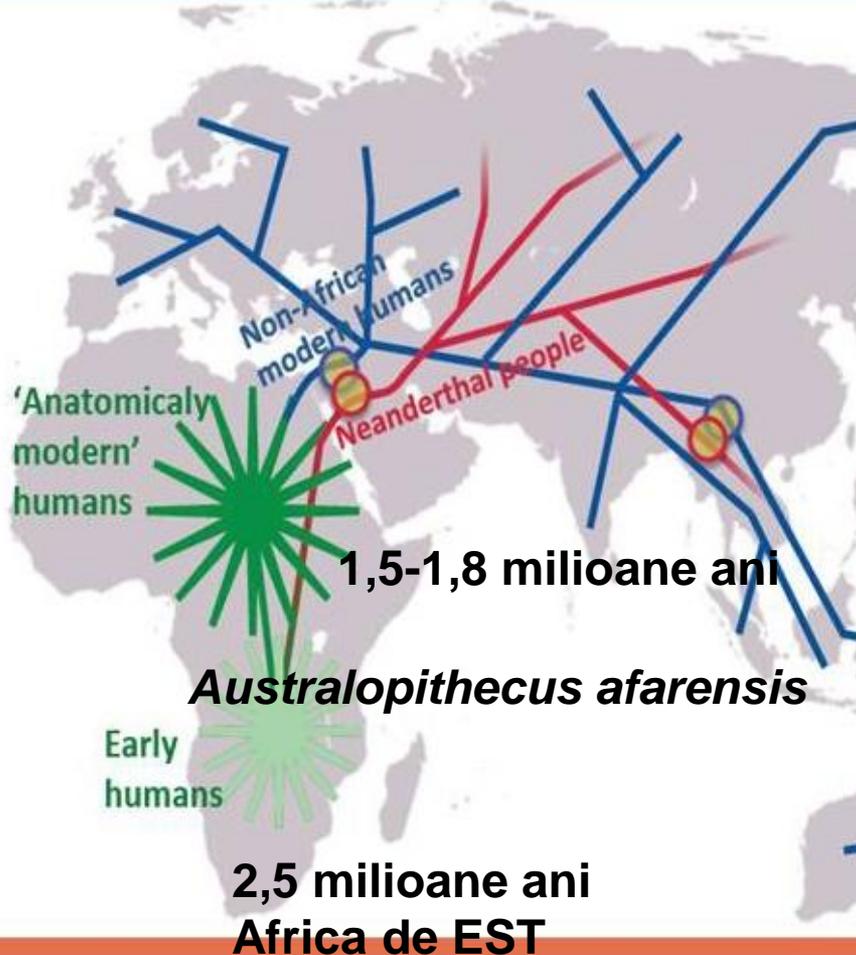


**EVOLUTION AND
THE ORIGIN OF
DISEASE**

Sapiens



ORIGINEA OAMENILOR PE PAMANT?



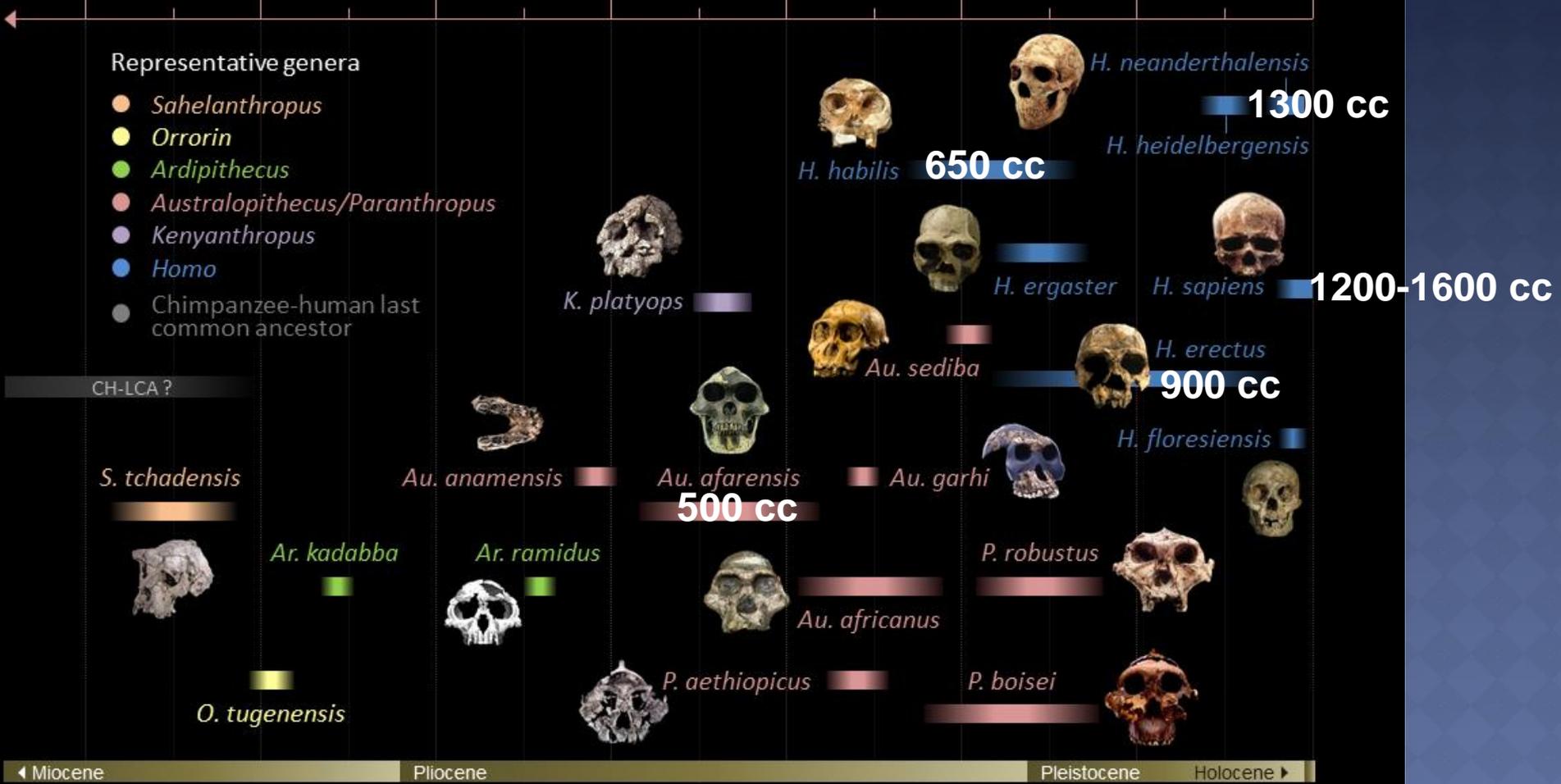
Hominid evolution



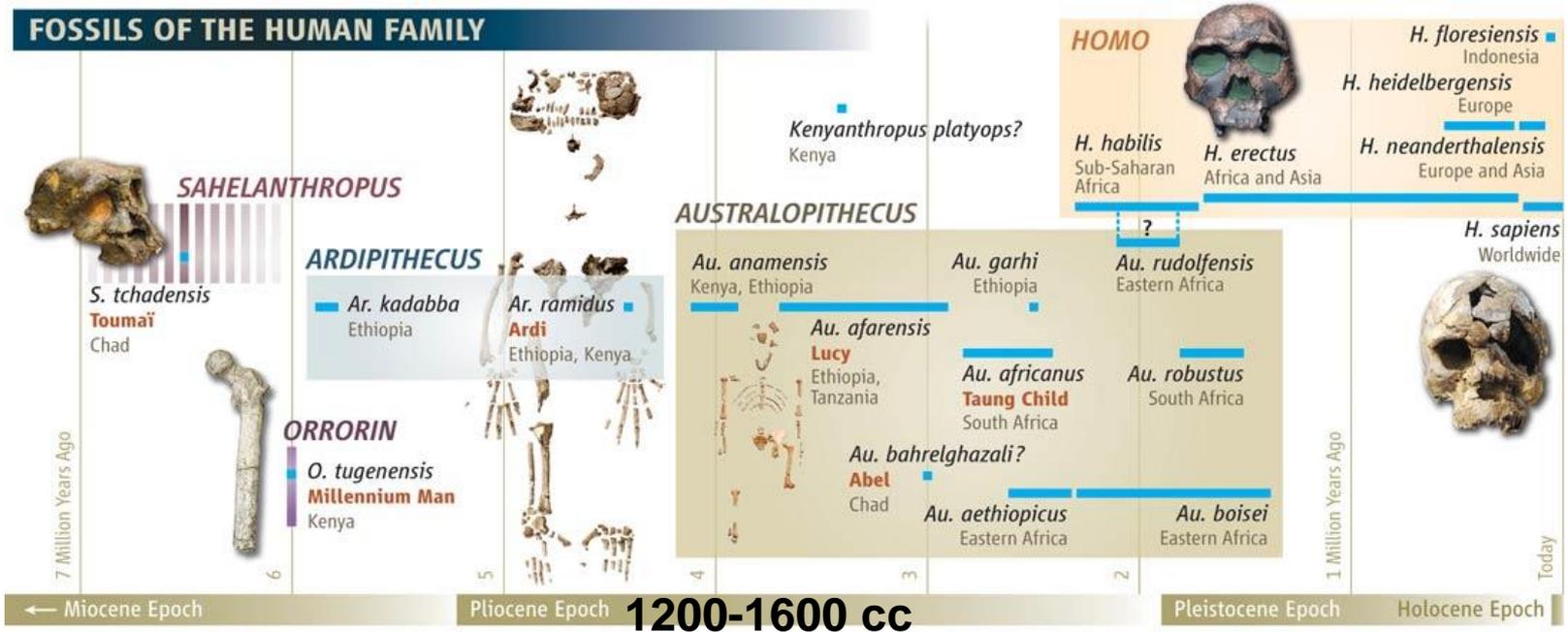
7.0 mya 6.0 5.0 4.0 3.0 2.0 1.0 0.0

Representative genera

- *Sahelanthropus*
- *Orrorin*
- *Ardipithecus*
- *Australopithecus/Paranthropus*
- *Kenyanthropus*
- *Homo*
- Chimpanzee-human last common ancestor

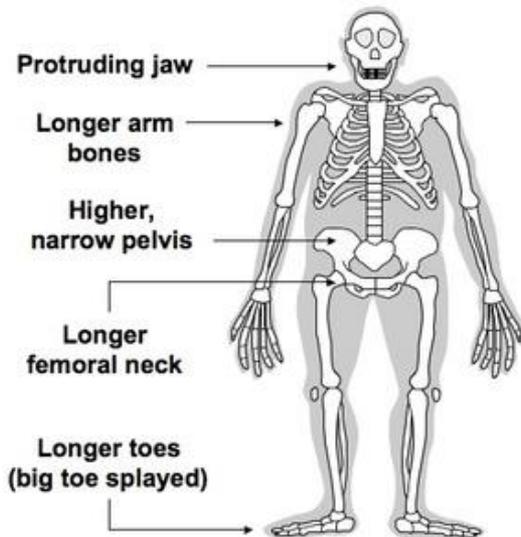


FOSSILS OF THE HUMAN FAMILY

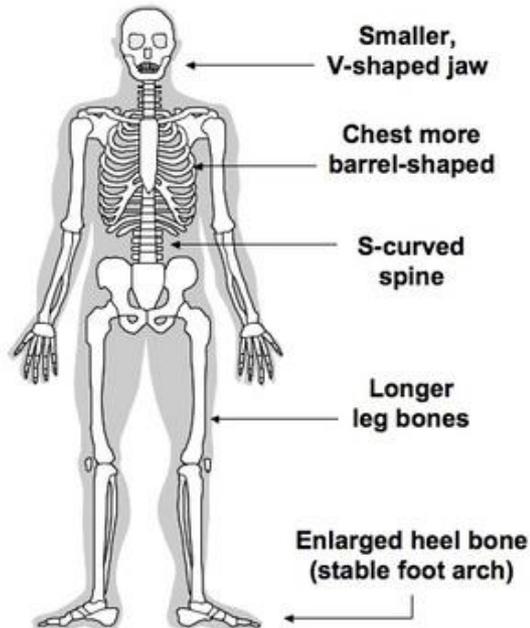


400-500 cc

Australopithecus
 (facultative biped)



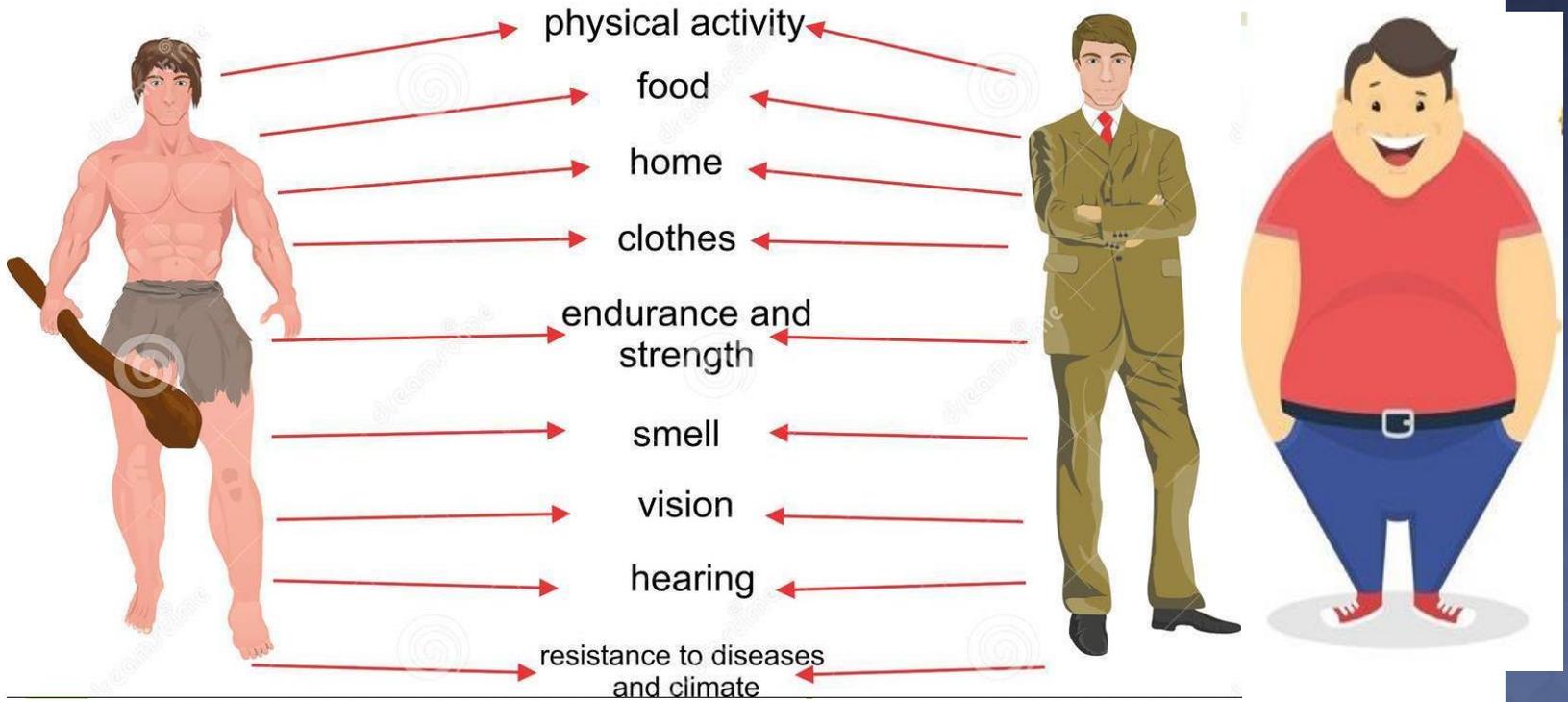
Homo sapiens
 (obligate biped)



<http://www.berkeley.edu/news/media/releases/2009/10/images/ardi-timelineHR.jpg>

WHAT HAS CHANGED?





10 Diseases Caused by Evolutionary Mismatches

These diseases were once rare, but are today highly prevalent. You can lower your risk of developing these and many other mismatch diseases by adhering to a species-appropriate diet and lifestyle

www.Darwinian-Medicine.com

Myopia

Common causes: Too much near work, chronic inflammation, imprudent, highly insulinogenic diet, inadequate outdoor activity

Asthma

Common causes: Chronic inflammation, dysbiosis, immune dysregulation, air pollution, indoor allergens

Non-alcoholic fatty liver disease

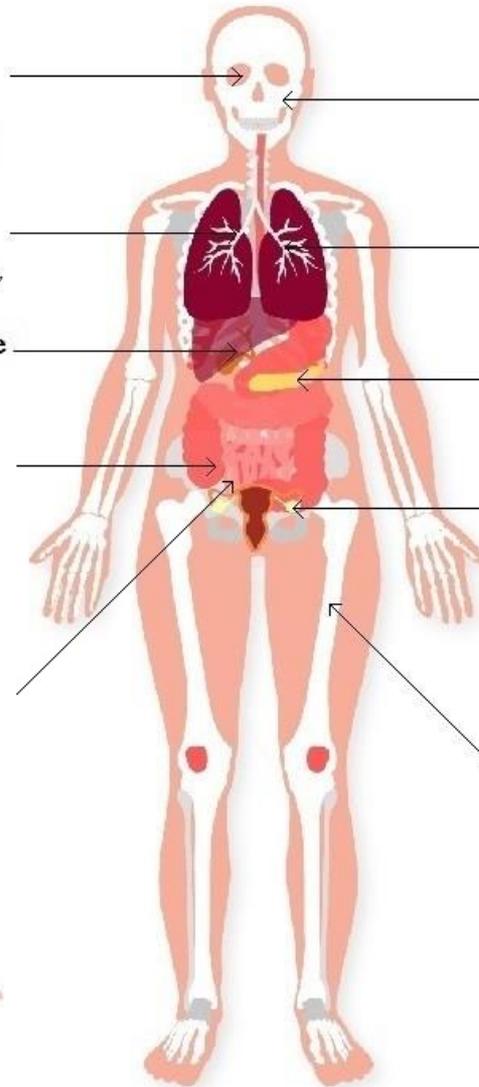
Common causes: The metabolic syndrome, obesity, imprudent, calorie-dense diet, inadequate physical activity

Inflammatory bowel disease

Common causes: Inflammation, severe gut dysbiosis, imprudent diet

Colon cancer

Common causes: Colonic dysbiosis, imprudent, low-fiber diet



Acne vulgaris

Common causes: Dysbiosis of the skin and gut, chronic inflammation, imprudent, refined diet

Chronic obstructive pulmonary disease

Common causes: Inflammation, smoking, lung dysbiosis, pollution, various airborne chemicals

Type-1 diabetes

Common causes: Gut dysbiosis, immune dysregulation, chronic inflammation

Ovarian cancer

Common causes: High number of menstrual cycles, inflammation, obesity, hormonal dysregulation

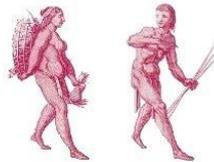
Osteoporosis

Common causes: Inadequate physical activity (in particular weight-bearing activities), unhealthy diet, inadequate sun exposure

The Etiology, Prevention, and Treatment of the Diseases of Civilization

A Darwinian Conceptual Framework

www.Darwinian-Medicine.com



2.6 million years ago
Start of the Paleolithic era

12,000 years ago
The Agricultural Revolution

250 years ago
The Industrial Revolution

Present time

Environments of evolutionary adaptedness

Genome-environment mismatch

Living conditions

- Natural environment
- Small mobile, isolated communities

Life style

- Regular physical activities
- occasional bouts of acute stress
- Plenty of syn expouser
- Sleep patterns synchronized with natural fluctuations in light and dark

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2.6 million years ago
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The Agricultural Revolution

250 years ago
The Industrial Revolution

Present time

The Environments of Evolutionary Adaptedness (EEA)

Living conditions

- Natural environment
- Small, mobile, and isolated communities



Health/physical fitness

- Low incidence of chronic diseases (e.g., heart disease, cancer, diabetes, osteoporosis)
- Low incidence of malocclusion, myopia, and musculoskeletal disorders
- Low incidence of infectious disease
- Good general health
- Good cardiorespiratory fitness

Lifestyle

- Regular physical activity
- Occasional bouts of acute stress
- Plenty of sun exposure
- Sleep patterns synchronized with the natural fluctuations in light and dark



Longevity

- Low average life expectancy, due in part to high infant mortality
- Modal (most common) age of adult death may have been approx. 70

Diet

- Meat, seafood, eggs, nuts, vegetables, and fruit
- Exclusively composed of wild plants and animals
- Nutrient dense
- Low in antinutrients
- High in protein, omega-3, and fiber
- Low in sugar, omega-6, and saturated fat

Phenotype

- Lean
- Moderately muscular
- Broad shoulders
- Tall
- Wide, well-developed jaws and faces

Genome-environment mismatch

Living conditions

- ↑ Population density
- ↑ Pathogens
- ↓ Microbial old friends
- ↓ Mobility



Health/physical fitness

- ↑ Chronic, lifestyle-related diseases
- ↑ Infectious disease
- ↑ Bone-related disorders (e.g., malocclusion, osteoporosis)
- ↑ Oral health problems (e.g., tooth decay)
- ↓ Cardiorespiratory fitness
- ↓ General health

Lifestyle

- ↓ Aerobic exercise
- ↓ Sun exposure



Longevity

- ↓ Average life expectancy (at least initially), in part due to an increased infectious disease burden

Diet

- ↑ Famine
- ↑ Cereal grains and dairy
- ↑ Starch, alcohol, sugar, omega-6, and saturated fat
- ↑ Antinutrients
- ↓ Nutrient density
- ↓ Diet diversity
- ↓ Protein, omega-3, and fiber



Phenotype

- ↓ Facial development
- ↓ Height



Genome-environment mismatch

Living conditions

- ↑ Social isolation
- ↑ Microbes associated with the built environment
- ↑ Pollutants and harmful chemicals
- ↑ Artificial lighting
- ↑ Technology
- ↓ Microbial old friends
- ↓ Natural biodiversity



Health/physical fitness

- ↑ Chronic, lifestyle-related diseases (e.g., cancer, autoimmune conditions, cardiovascular disease)
- ↑ Chronic health problems (e.g., myopia, depression, anxiety, back pain)
- ↑ Chronic inflammation
- ↓ Infectious disease (developed nations)
- ↓ Cardiorespiratory fitness
- ↓ Muscular strength
- ↓ General health

Lifestyle

- ↑ Chronic stress
- ↑ Drugs
- ↓ Sleep duration and quality
- ↓ Physical activity
- ↓ Sun exposure



Longevity

- ↑ Average lifespan (industrialized nations), in part due to modern medicine

Diet

- ↑ Processed food
- ↑ Sugar, salt, trans-fat, saturated fat, starch, omega-6, and fructose
- ↑ Energy density
- ↓ Nutrient density
- ↓ Fiber, omega-3, and protein
- ↓ Fasting



Phenotype

- ↑ Fat mass
- ↑ Anterior pelvic tilt
- ↑ Shoulder protraction
- ↓ Muscle mass
- ↓ Facial development and width
- ↓ Shoulder broadness

The Human Condition

From Hunter-Gatherer to Doughnut-Eating Office Worker

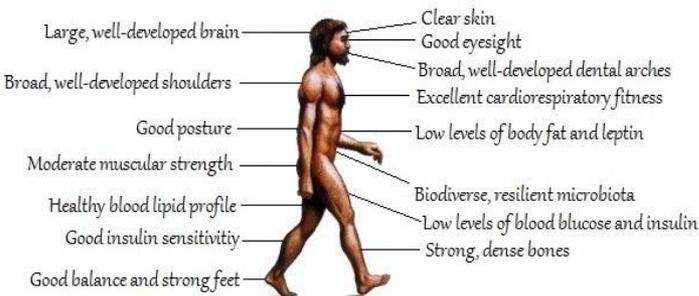
www.Darwinian-Medicine.com

The Environments of Evolutionary Adaptedness

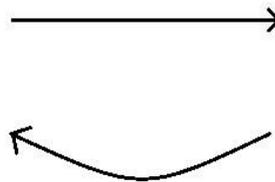
Species-appropriate nutrition, regular physical activity, low exposure to pollutants and harmful chemicals, frequent social interactions, adequate sun exposure, adequate sleep, species-appropriate microbial milieu, intermittent bouts of acute stress

Modern Environments

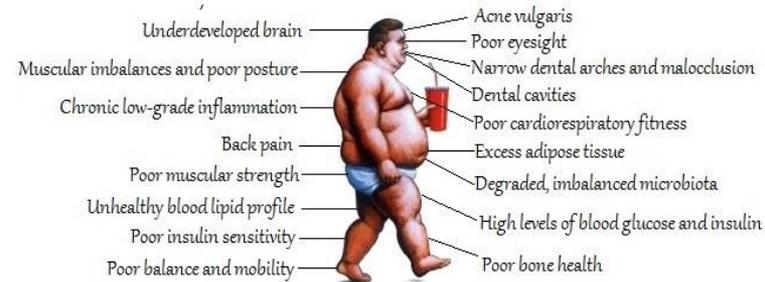
Species-inappropriate nutrition, inadequate physical activity, high exposure to pollutants and harmful chemicals, social isolation, inadequate sun exposure, disordered and inadequate sleep, species-inappropriate microbial milieu, chronic stress, exposure to artificial light and modern technology



Changes in gene expression caused by rapid and profound environmental changes



Mismatch resolution via Darwinian medicine



EAT
to
LIVE

LIVE
to
EAT



EVOLUTIONARY MEDICINE

