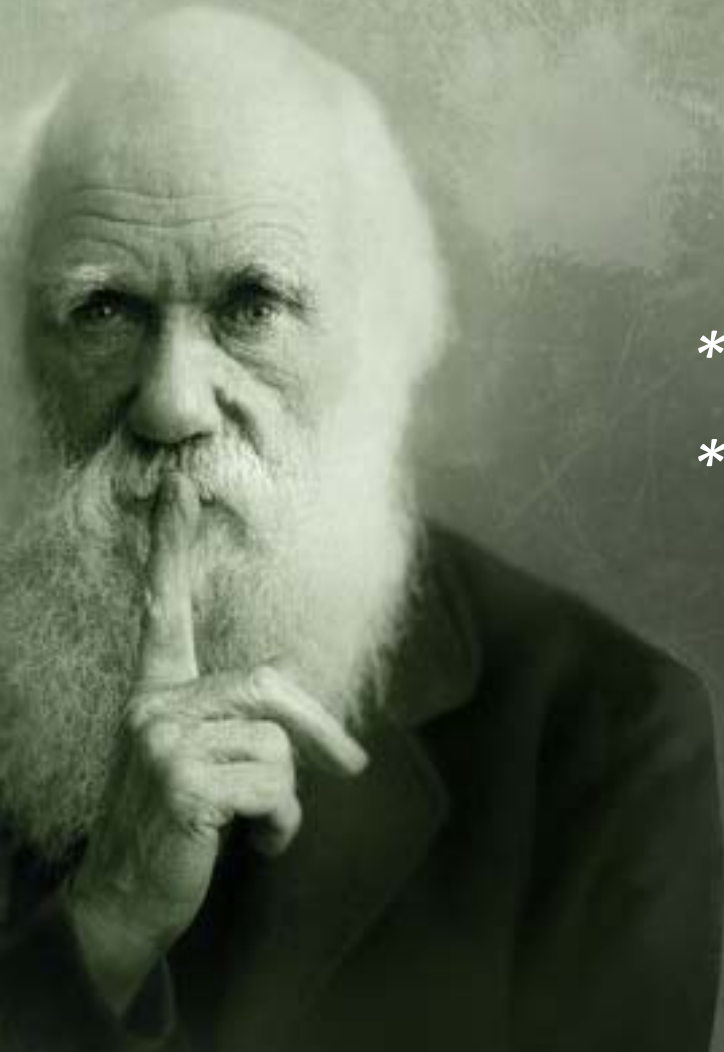


Mutation

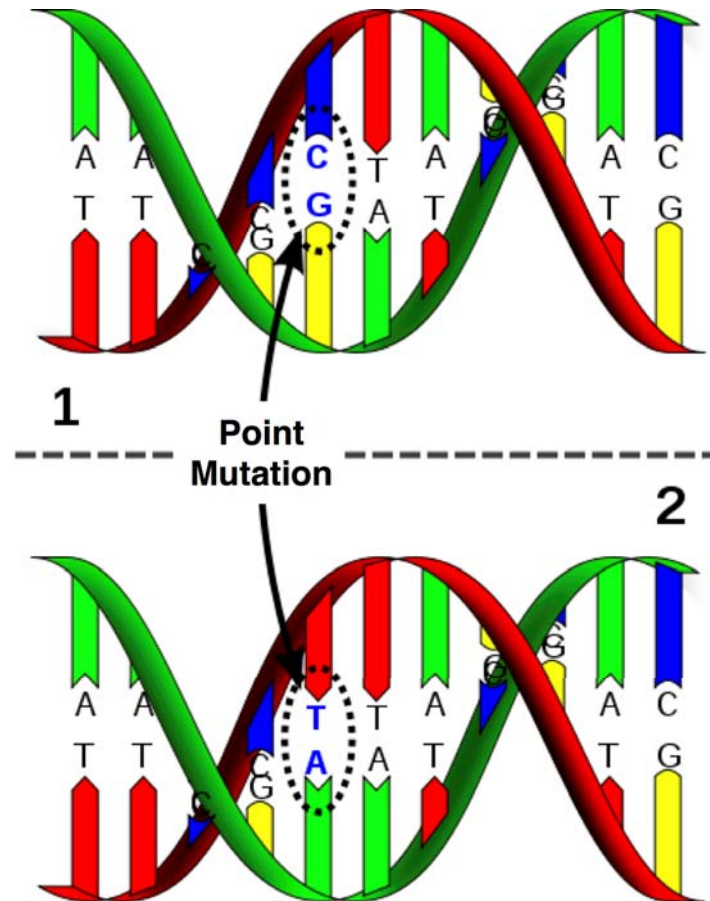
By Rafael Navajas Pérez

- * What is a genetic mutation?*
- * Is it a positive or a negative thing?*



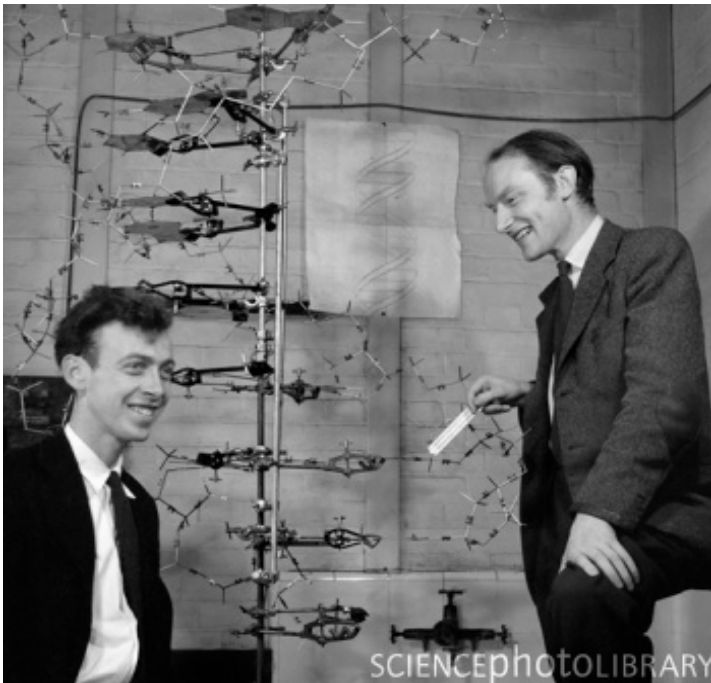
What is a mutation?

Mutation.- A change in nucleotide sequence of a genome.



DNA Structure

James Watson (1928--).- American biologist
Francis Crick (1916-2004).- English biologist



DNA has a double-helix structure like a twisted ladder. The steps of the ladder are bases...

ADENINE (A) IS A BASE.

THYMINE (T) IS A BASE.

CYTOSINE (C) IS A BASE.

GUANINE (G) IS A BASE.



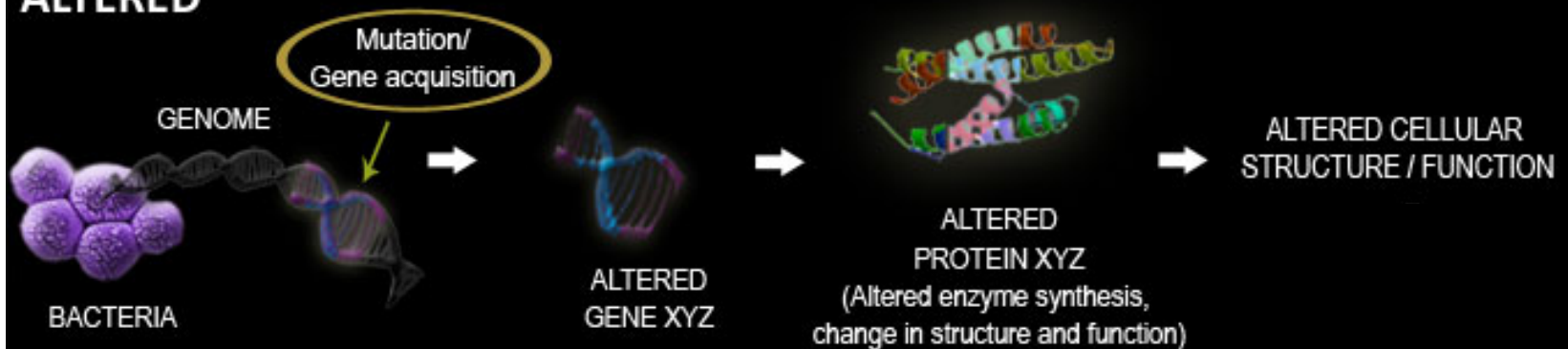
What is a mutation?

Mutation.- A change in nucleotide sequence of a genome.

NORMAL



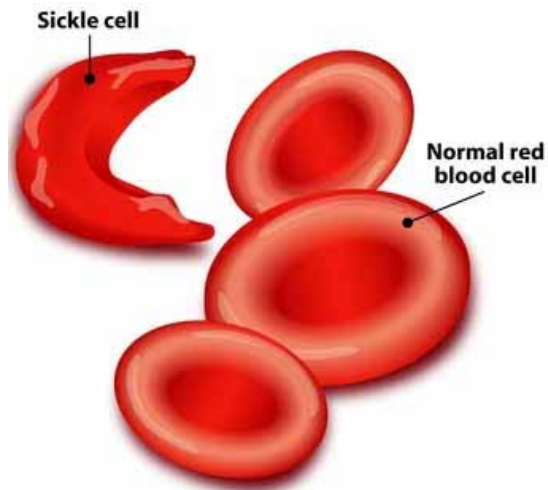
ALTERED



Types of mutations

Genetic (point) Mutation.- A mutation that involves short segments of DNA, even a single nucleotide.

A single-nucleotide mutation



Sickle-cell Anemia

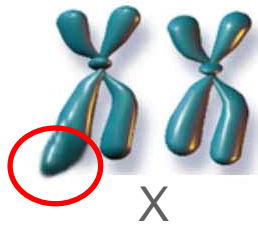


Phenylketonuria

Types of mutations

Chromosomal Mutation.- A mutation that involves long segments of DNA, even a whole chromosome.

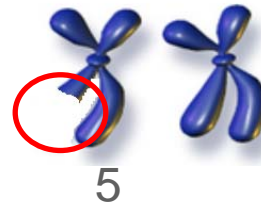
An extra piece of chromosome



X

Fragile X Syndrome

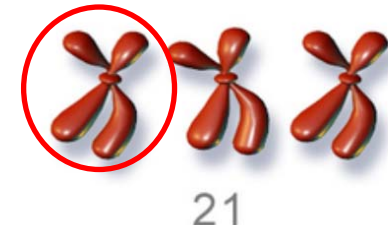
A piece of chromosome missing



5

Cri-du-chat's Syndrome

One Extra Chromosome

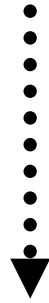


21

Down's Syndrome

But...

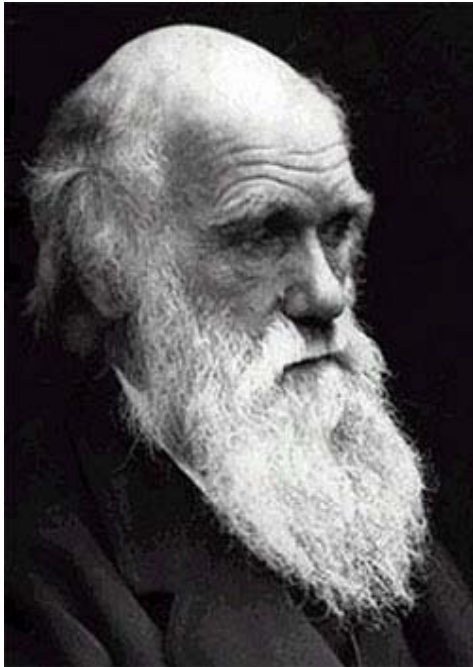
Is that all?



Of course not!

Looking on the Bright Side...

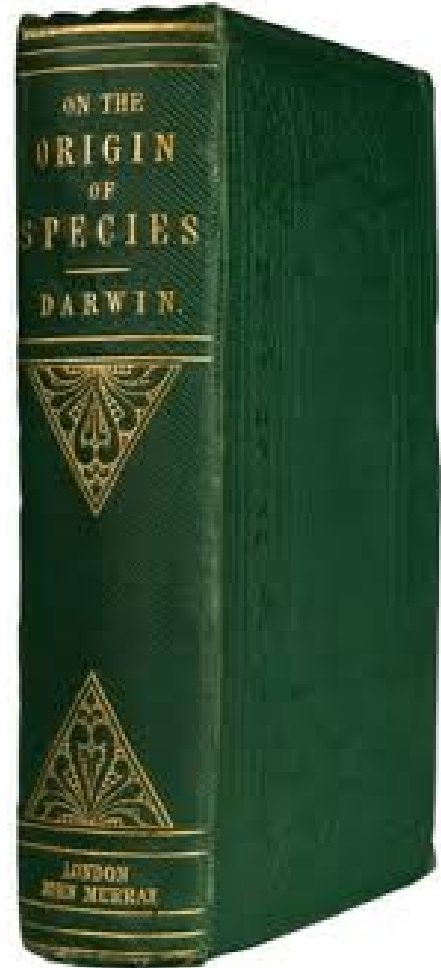
Charles Darwin.- British naturalist (1809-1882)



*Species change gradually
which means that they are
not immutable forms*

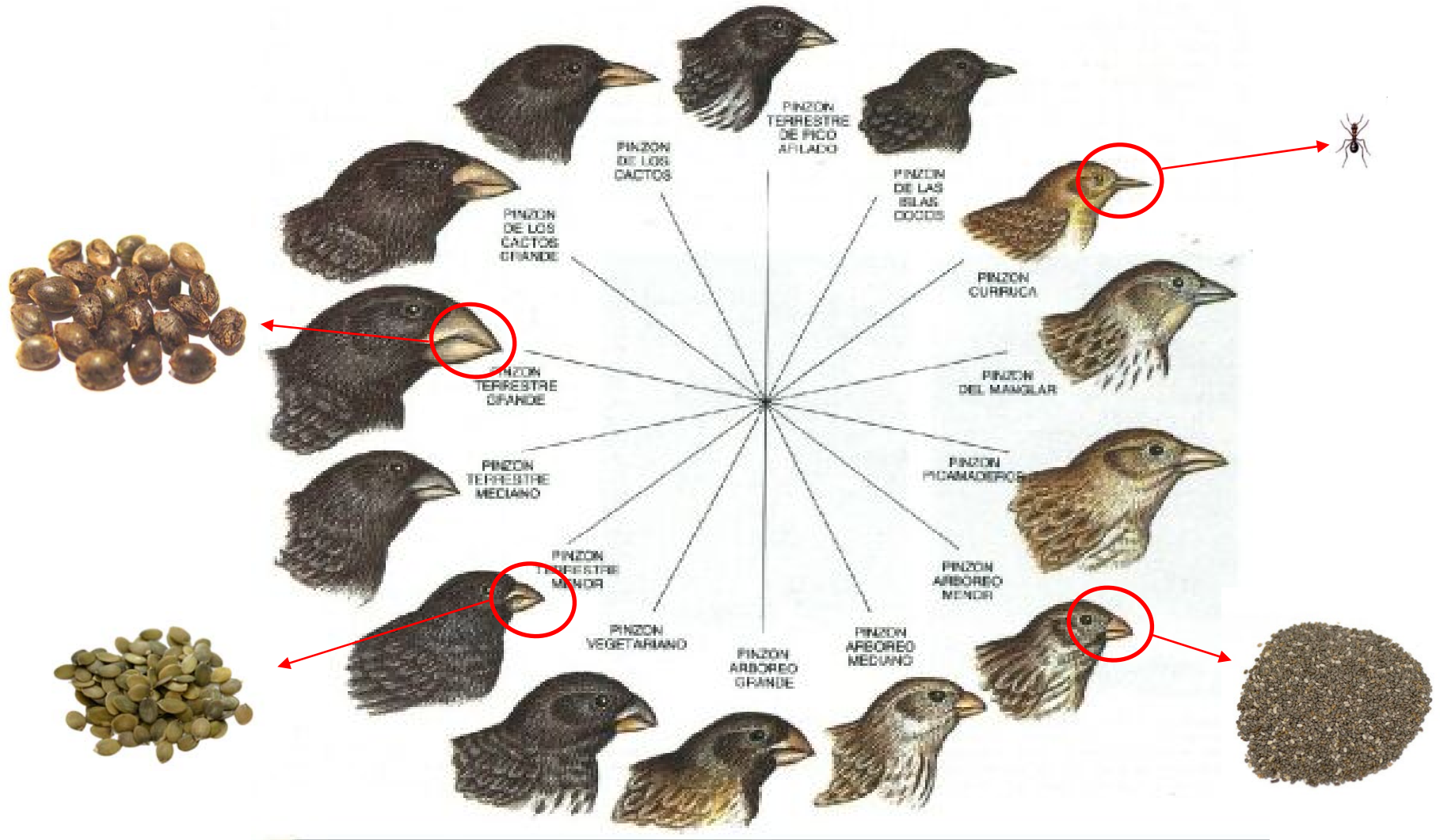


*The best adapted variants are chosen by
Natural Selection and will stay in detriment of
the less beneficial ones.*



Looking on the Bright Side...

An example.- Beak shape evolution in finches



Looking on the Bright Side...

Evolution just does not add up
without mutation!

Mutation rates

John Bowers, PhD.- American scientist at the University of Georgia.



Road trip to mutation

Mutation rates

John Bowers PhD.- American scientist at the University of Georgia.



[3 sodas every 100 miles]

Driver 1:



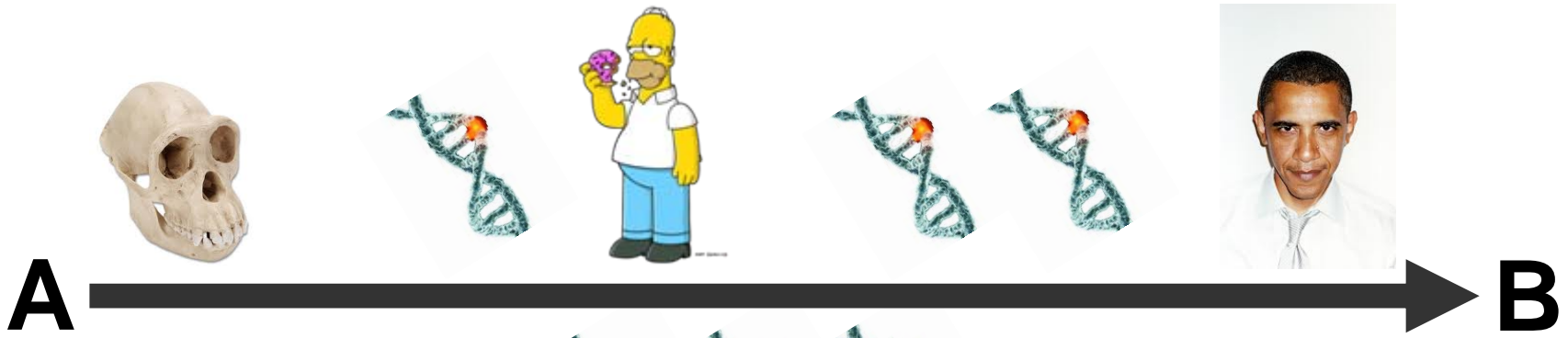
200 miles

Driver 2:



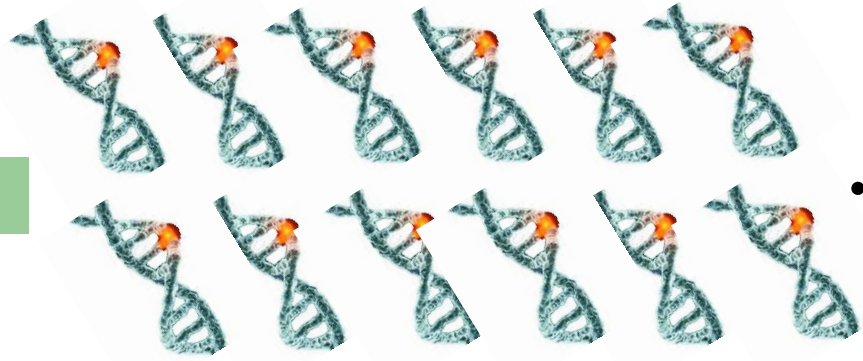
100 miles

Mutation rates



[3 mutations every 10 years]

Obama:



40 years

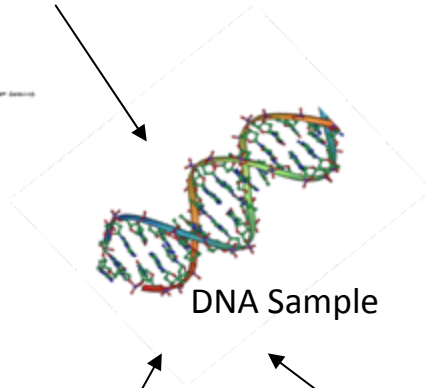
Homer:



10 years

DNA Analyses

PCR (Polymerase Chain Reaction).- Specific amplification of a DNA fragment (gene)



Monkey

ATCGGGATATATCGATAGAGAT

Homer

ATCGCGATATATTGATAGAGTT

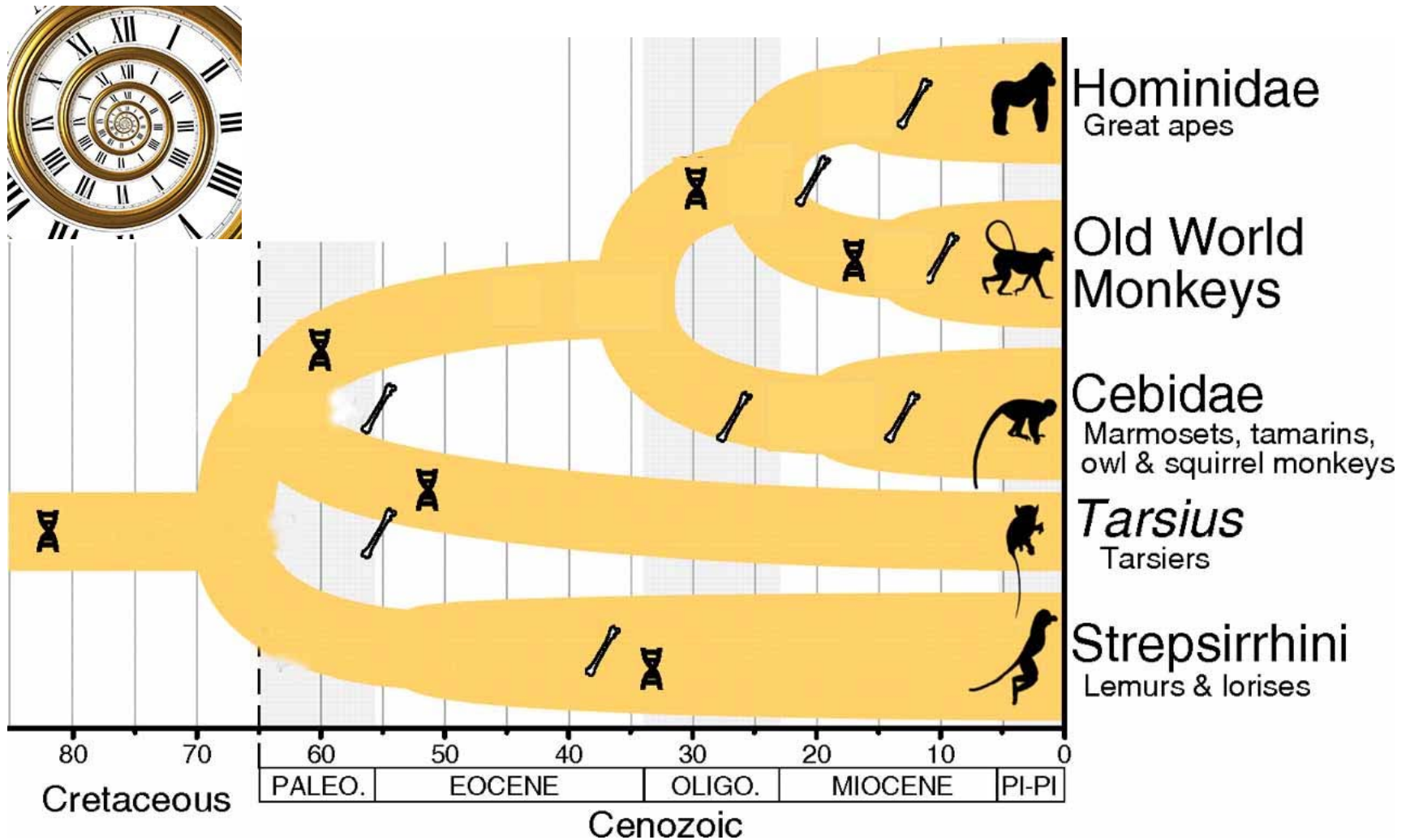
Obama

AGGGCGATATATTGATAGAGTT

Multiple alignment of sequences and comparison of homologous sites.

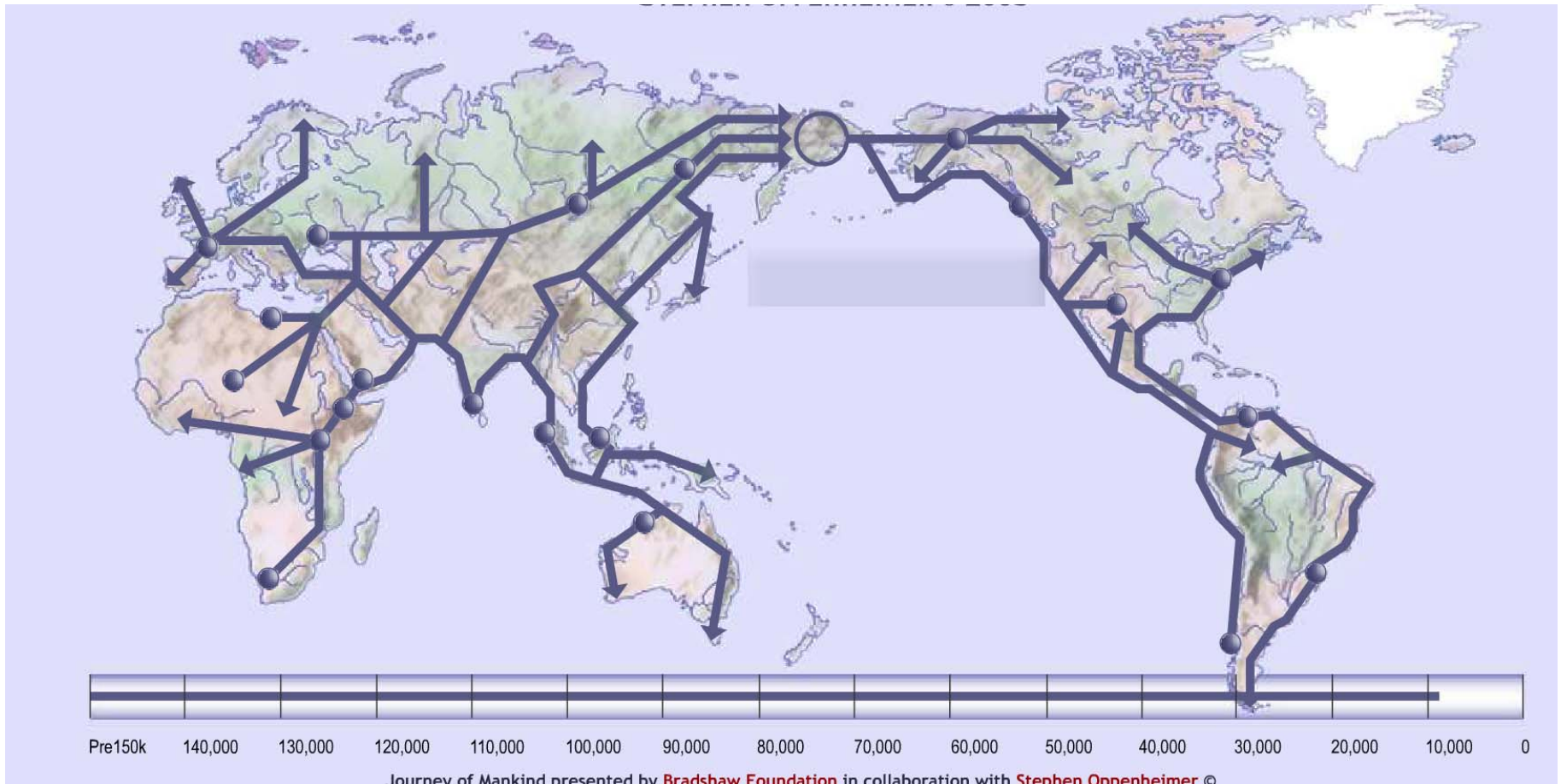
Time travel

Molecular Clock.- Average Mutation Rate for Mammalian Nuclear Genes: 2.2×10^{-9} per base pair per year



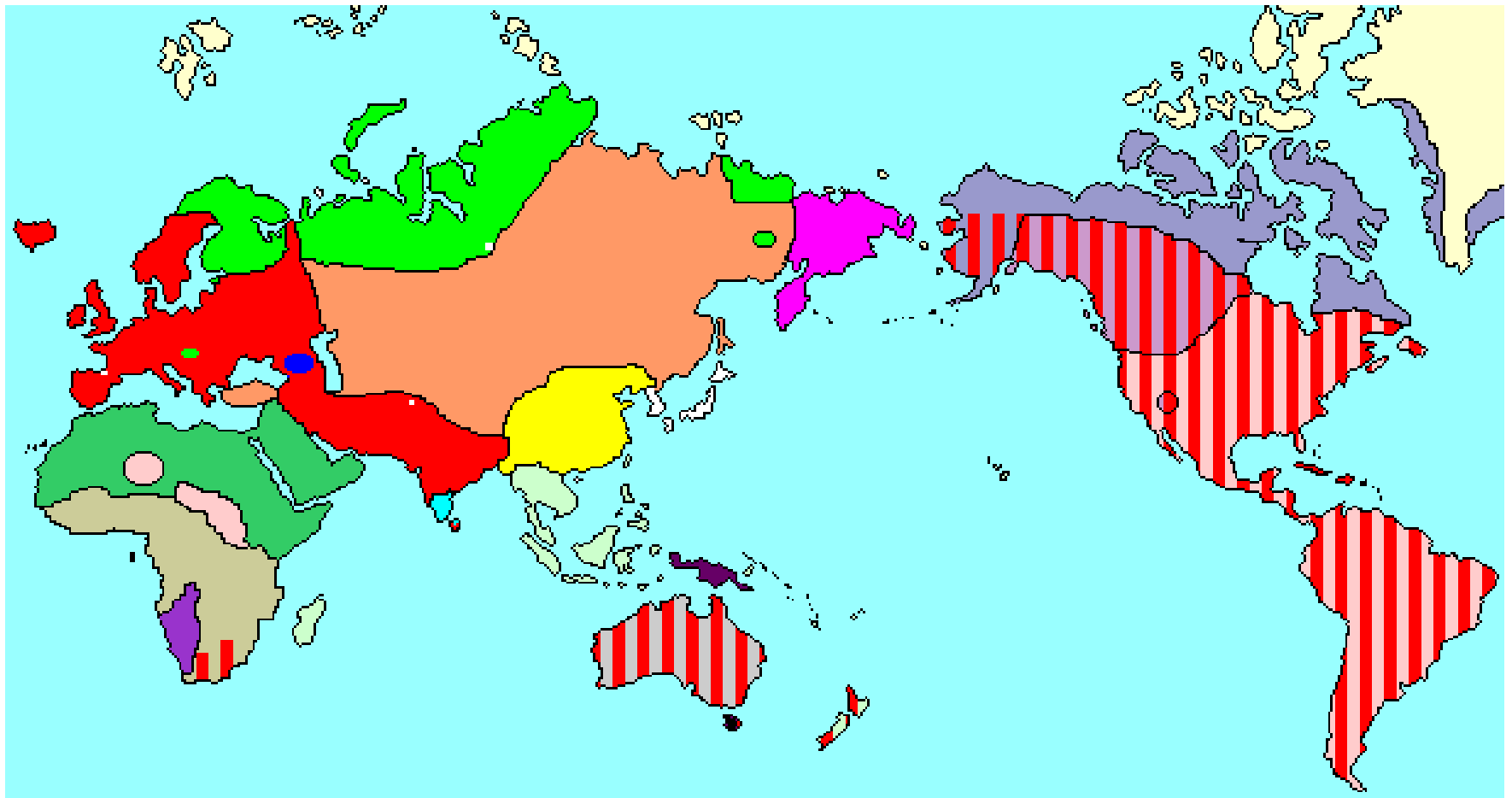
Time travel

An amazing voyage.- The journey of mankind



Time travel

An amazing voyage.- The evolution of languages



Thanks for listening!

“There is nothing permanent except change”. (Heraclitus, VI c. BCE)

