Introduction to Biology. Lecture 36

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Outline

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Where we are
End of Cretaceous ecological crisis

Cretaceous extinction of giant fauna

Well, this is me
who killed dinosaurs...

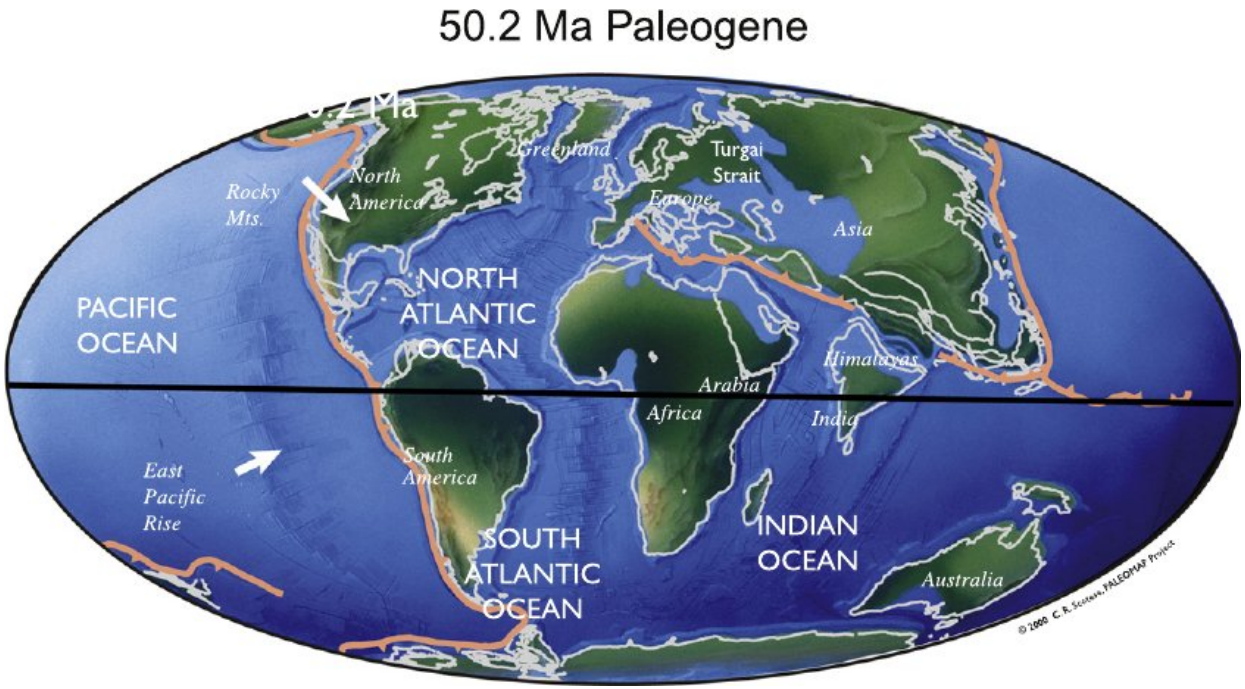
Where we are
Cenozoic era

From Paleogene to Quaternary

Cenozoic era:

- Paleogene: starts 66 Mya
  Includes:
  - Paleocene
  - Eocene
  - Oligocene
- Neogene: starts 23 Mya
  Includes:
  - Miocene
  - Pliocene
- Quaternary: starts 2.5 Mya
  Includes:
  - Pleistocene
  - Holocene

Paleogene

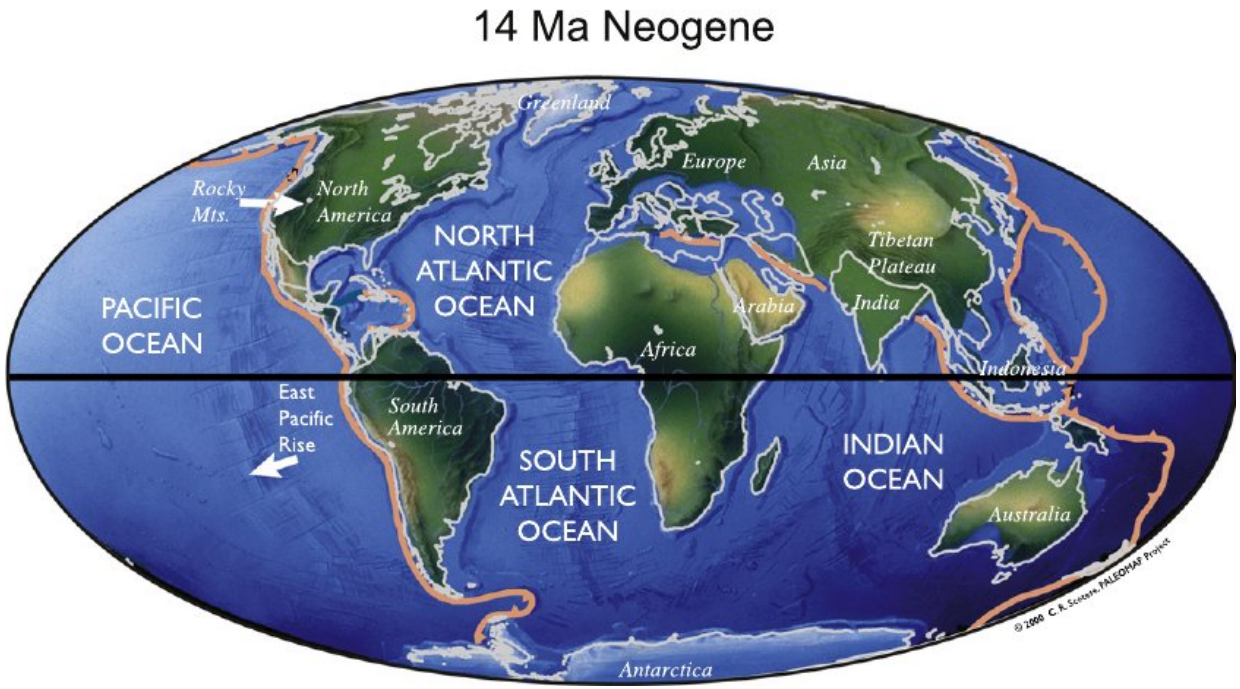


- Warm, even climate
- South America isolated, Tethys sea is slowly closing, India moves to Asia
- Mammals fill the big size class

Paleogene: when most of mammal orders appeared

Paleogene: when aliens temporarily took empty niches

Neogene



- Colder and drier
- Ice covers Antarctic, Americas united
- Grasses and hoofed mammals form grasslands

Quaternary

- Great glaciation again (the last was in Carboniferous)
- Rocky Mountains and Himalayas
- Humans

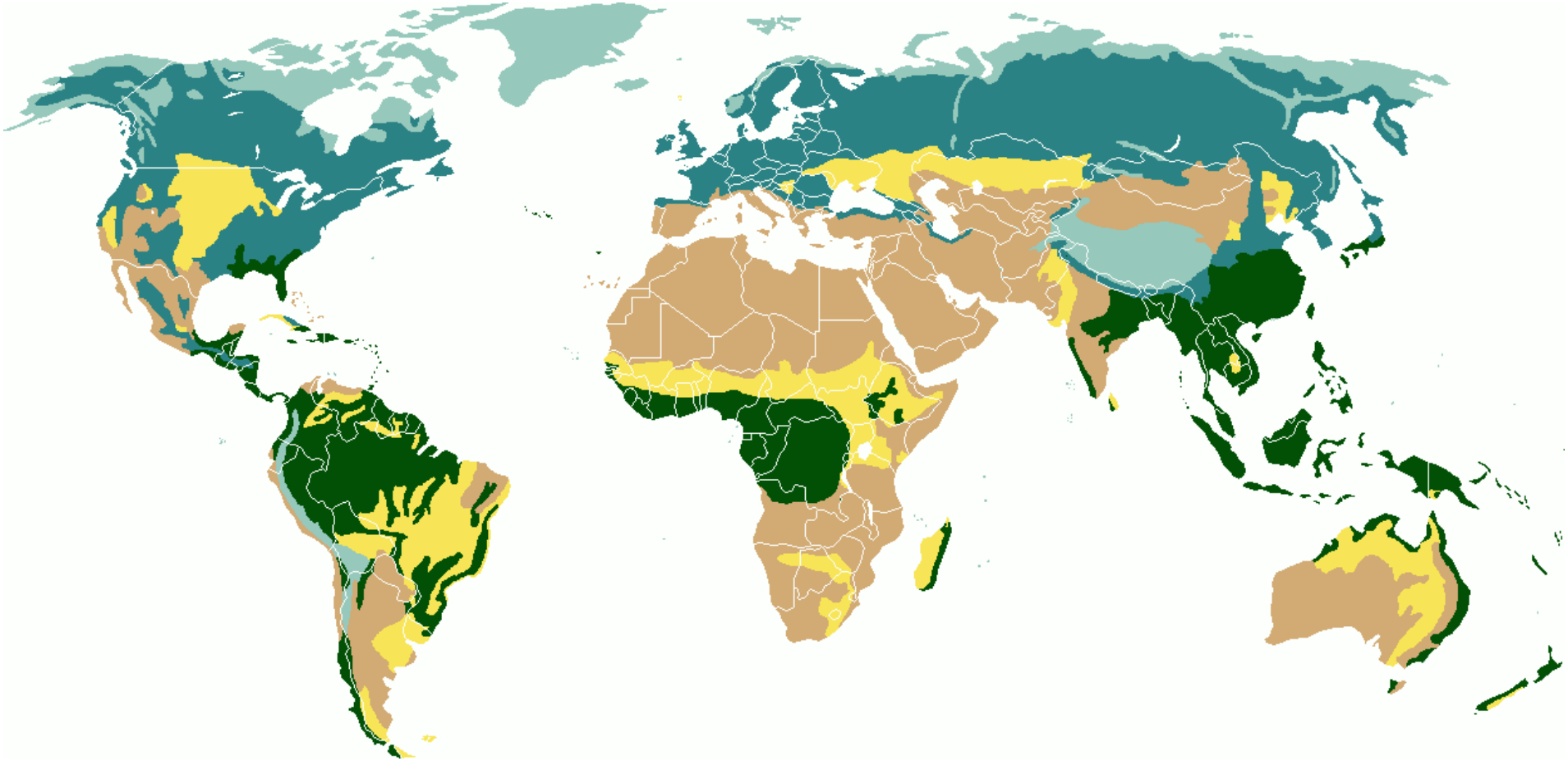
Where we are

Ecogeography: origin of biomes

Ecogeography

- The science which study the distribution of main ecosystems (biomes)
- Biomes are mostly based on vegetation

Map of Earth biomes (simplified from Wikipedia)



Tundra, boreal forests, grasslands, deserts, tropical forests

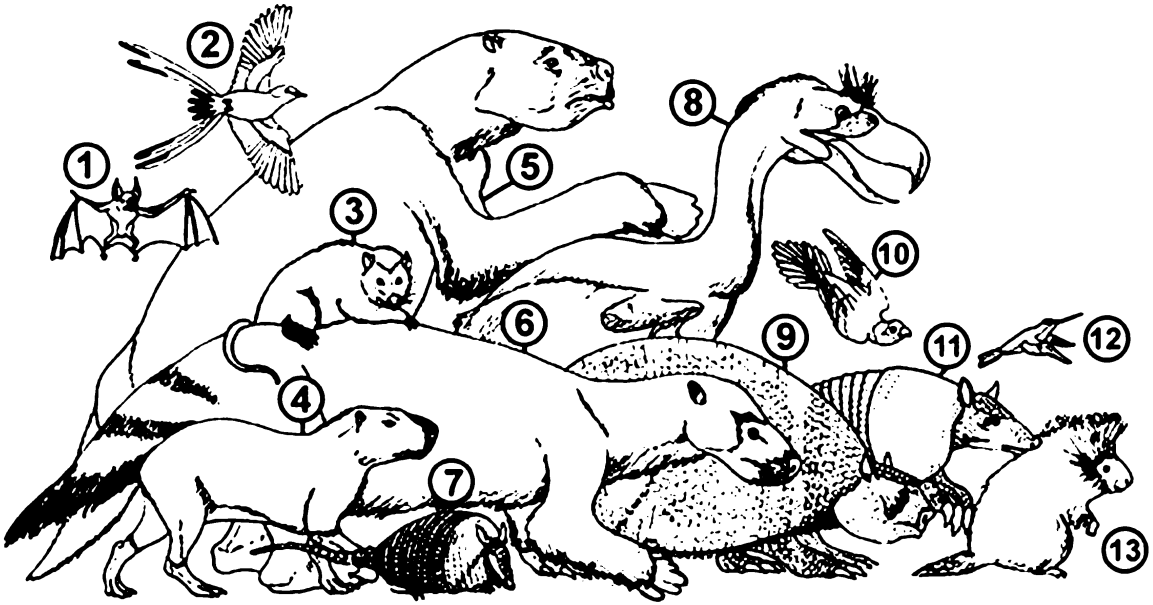
Origin of biomes

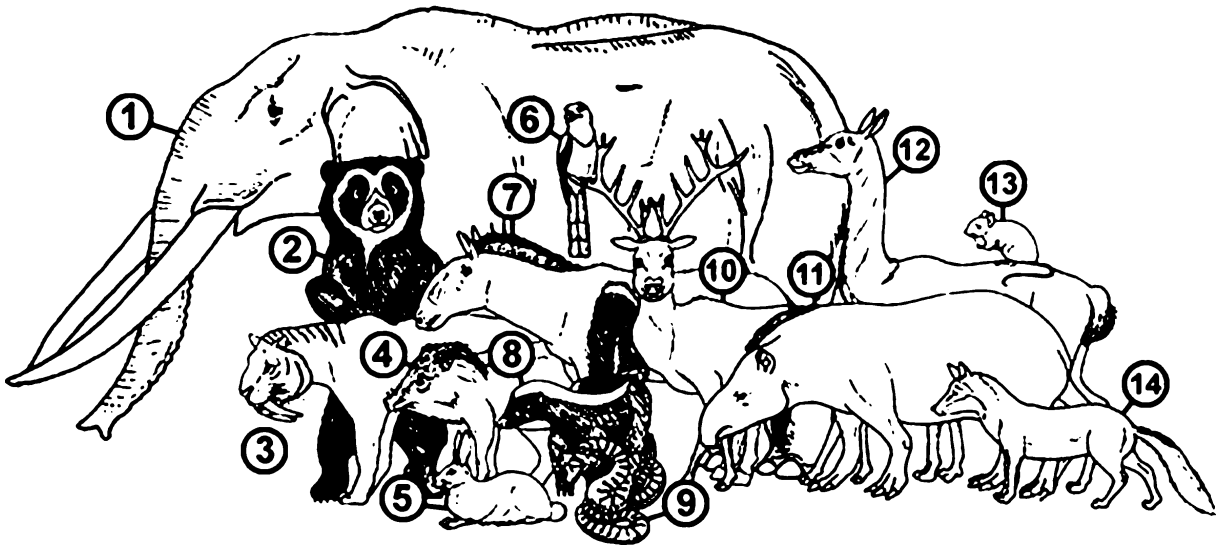
- Tundra: Quaternary, the newest biome
- Boreal forests: Paleogene, note the dominance of conifers
- Grasslands: Neogene, supports by both animals and plants
- Deserts: Permian (very old!)
- Tropical forests: Paleogene, “made” by plants and insects

Biogeography: Great American Interchange

- Before Neogene, South America was an isolated continent like Australia now and keeps very unusual fauna
- Formation of the Isthmus of Panama led to the dramatic exchange in fauna between South and North Americas
- More advanced northern animals invaded South America but some of southern species (like armadillo, porcupines, opossums, giant sloth) became very successful on the North.

Great American Interchange: north and south





Some of this fauna lives now or was exterminated by early humans

Origin of us

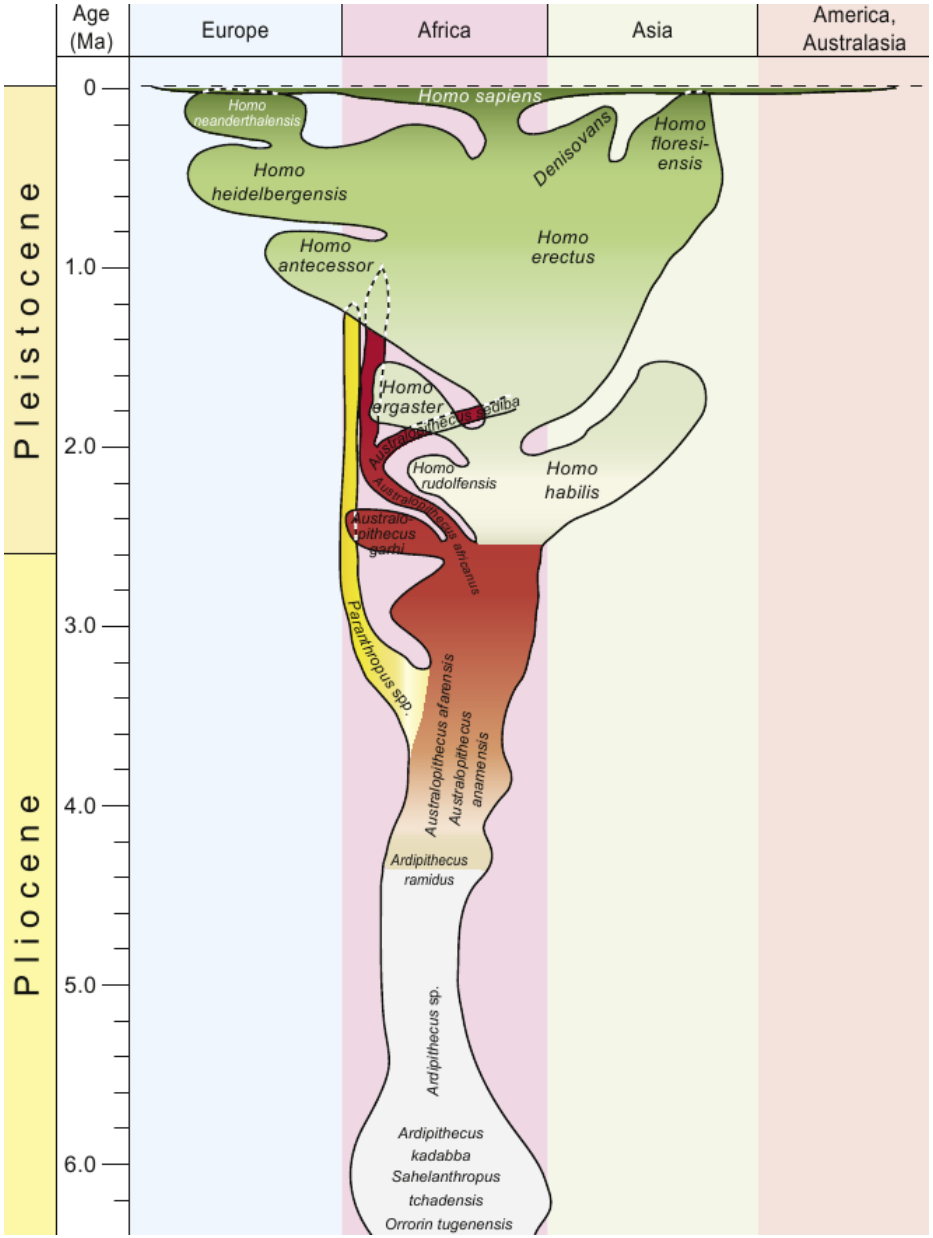
Just another ape

We and monkeys

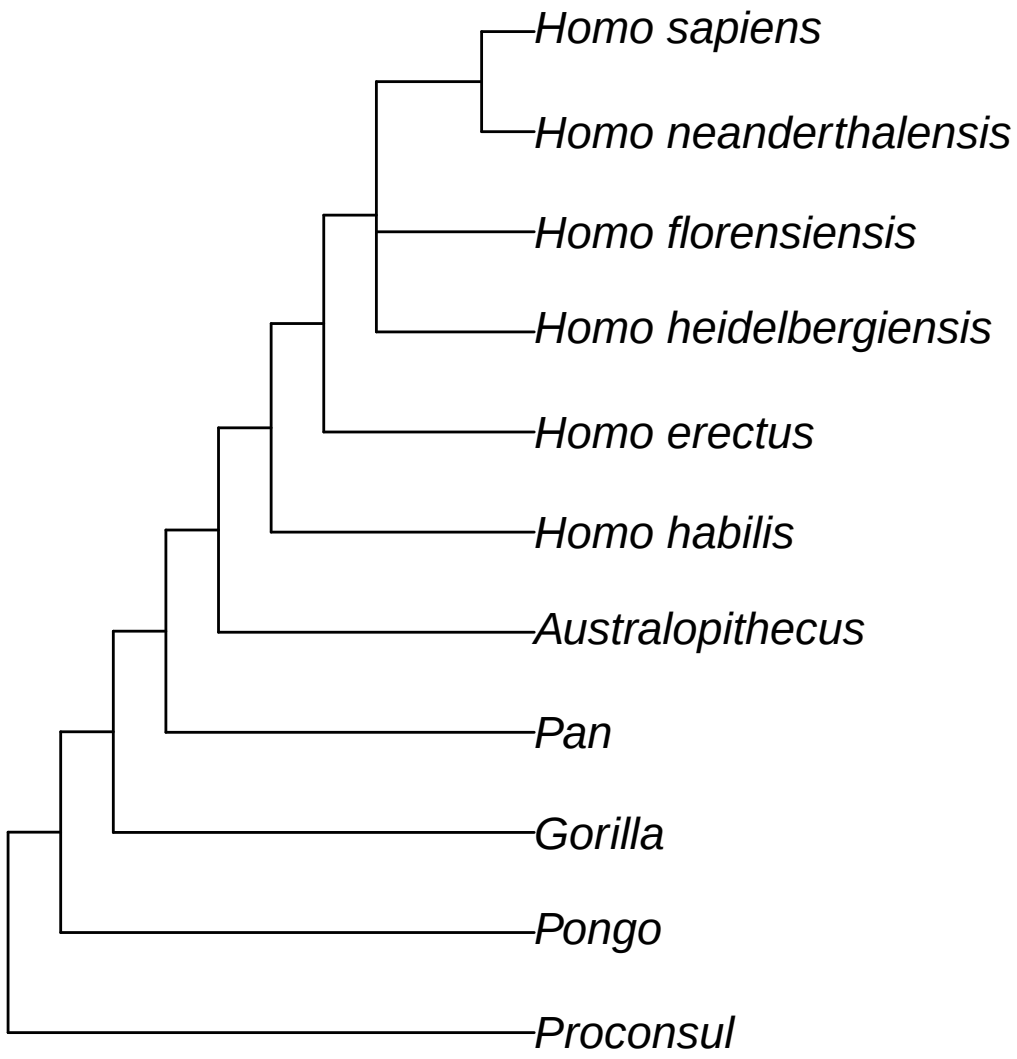
- It is scientifically correct to call us “monkeys” since we belong to the same order, Primates
- More strictly, humans and their relatives belong to the family Hominidae (hominids)

We and monkeys

Time and space of Hominidae evolution

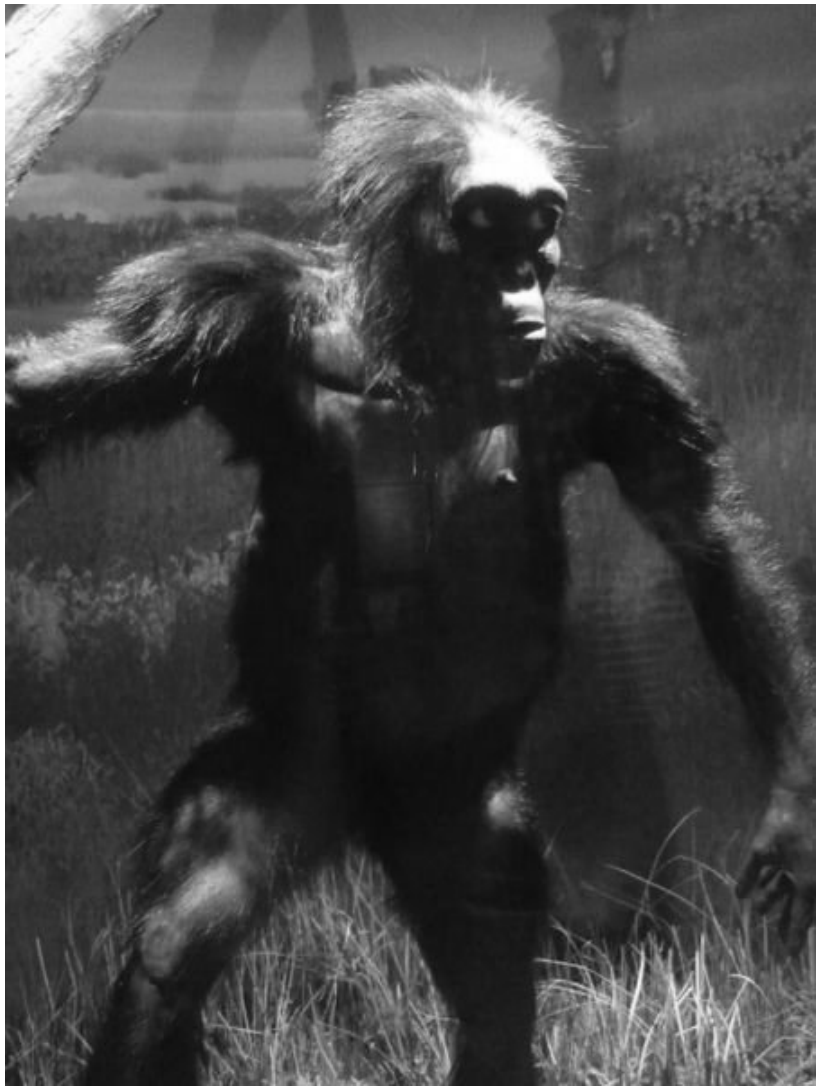


Phylogenetic tree of hominids (simplified)

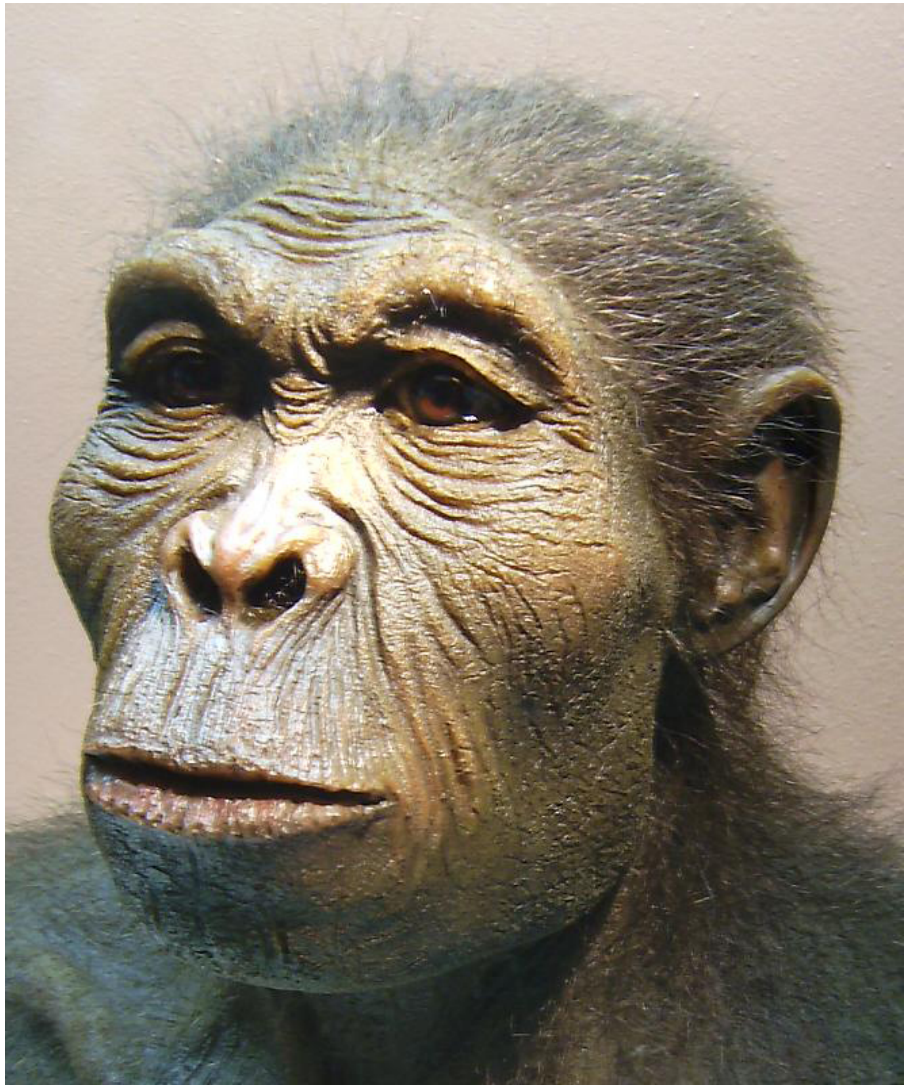


Please note that some terminal groups exchanges their genes (e.g., Neanderthals with modern humans)

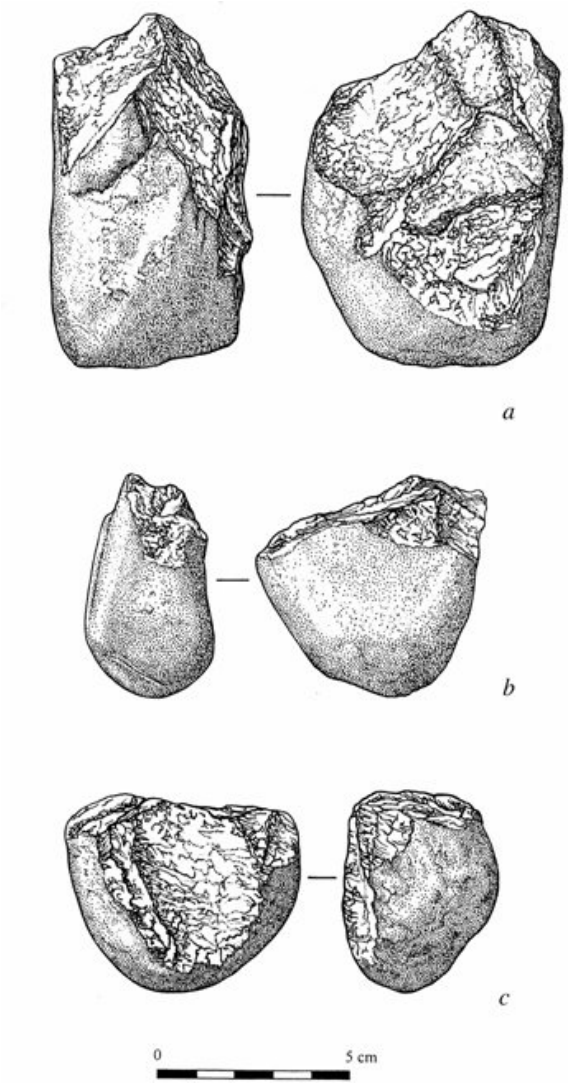
Step I: still a monkey—*Australopithecus* spp.



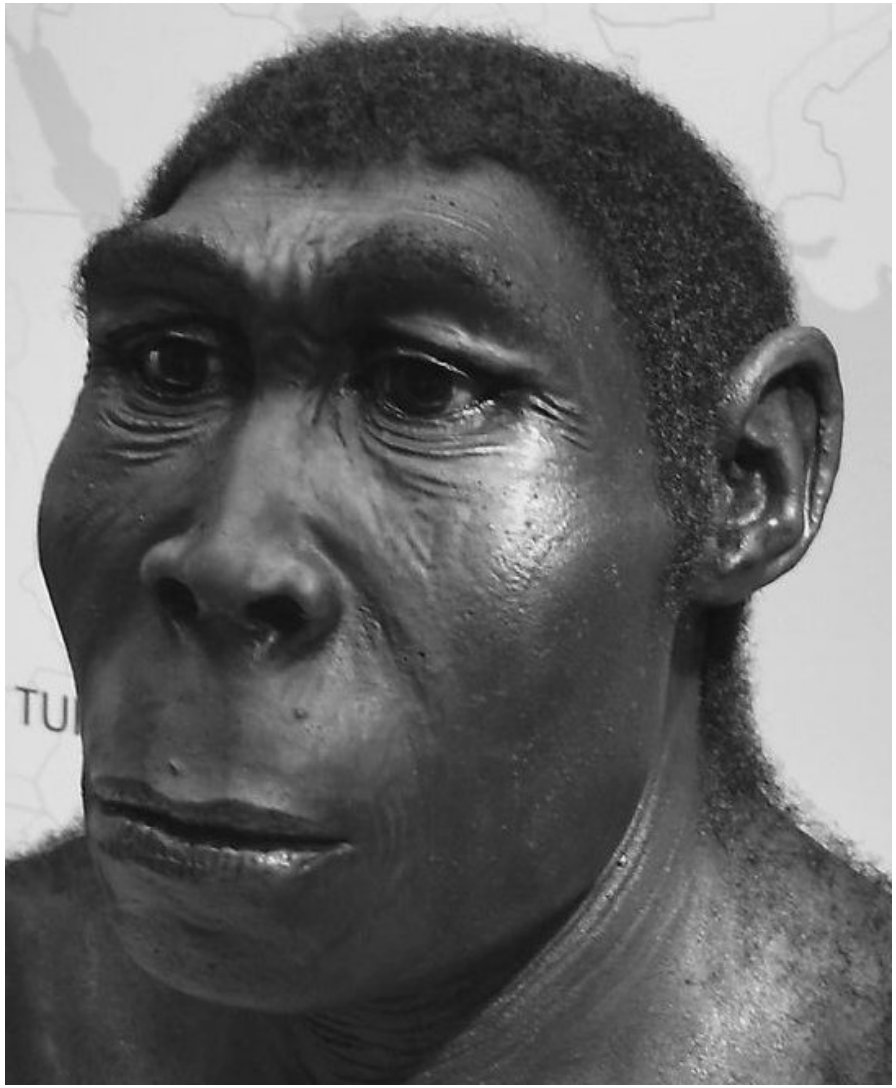
Step II: tool-maker—*Homo habilis*



... and his tools



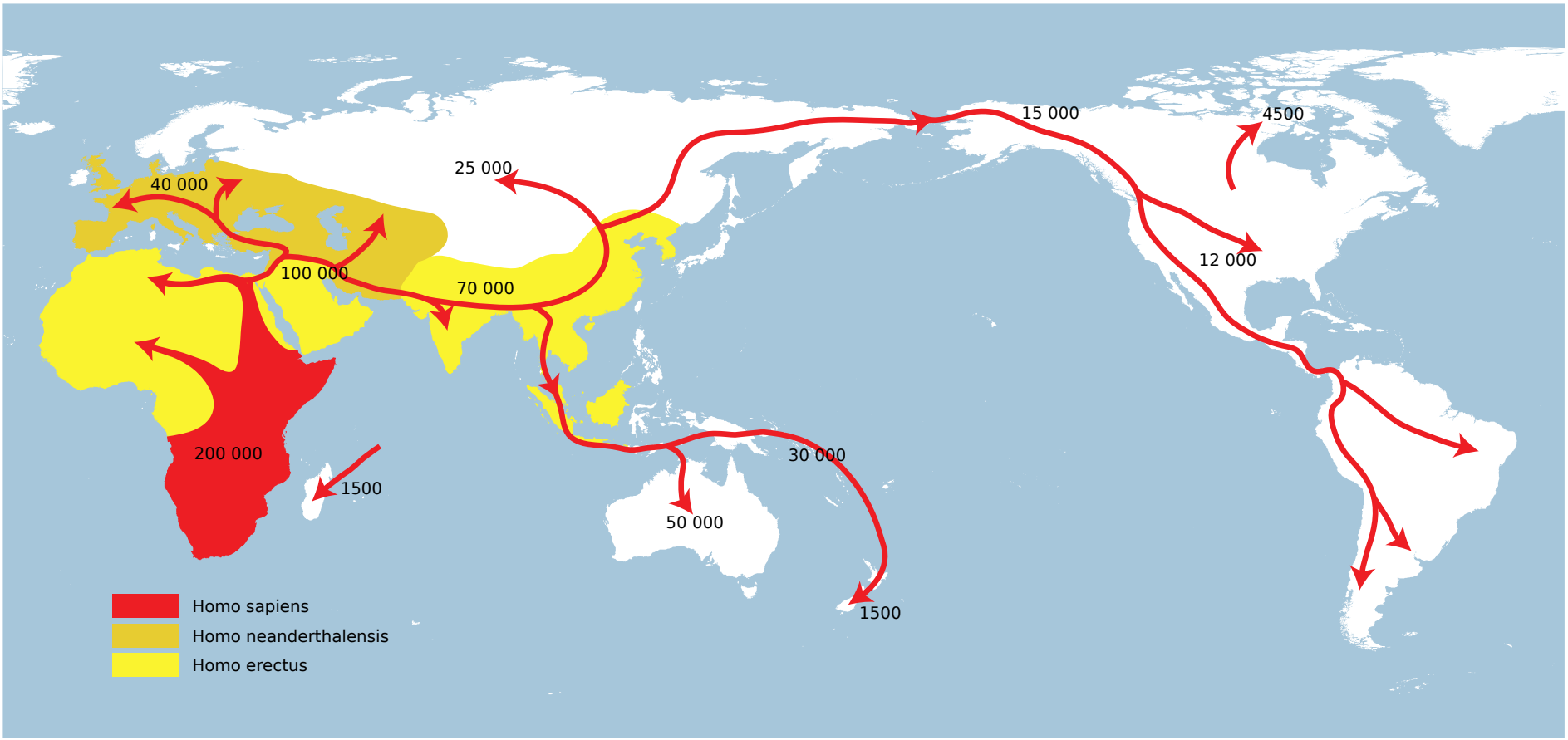
Step III: fire-maker—*Homo erectus*



Step IV: grave-maker—*Homo neanderthalensis*

Step V: *Homo sapiens* play the “Evolution” game

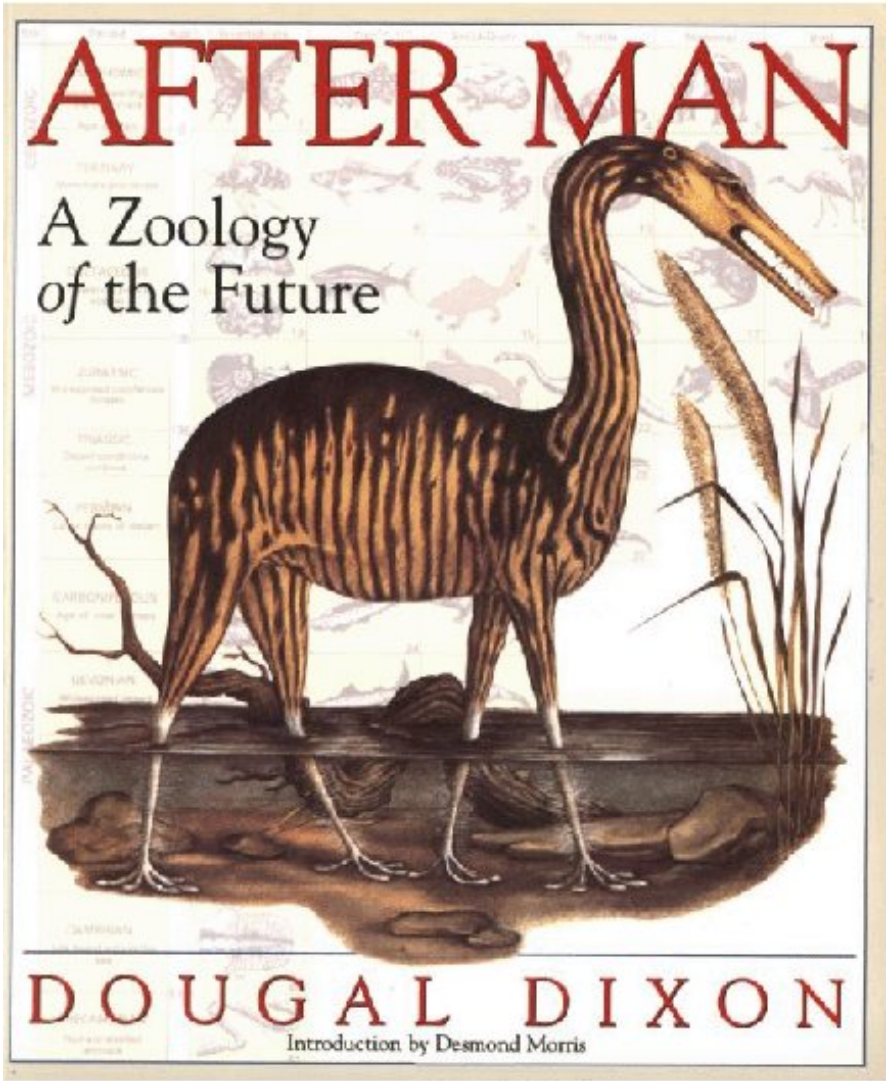
We all are out of Africa



Future evolution

Dougal Dixon and his “After Man” book

D. Dixon. After man. Zoology of the Future. 1981



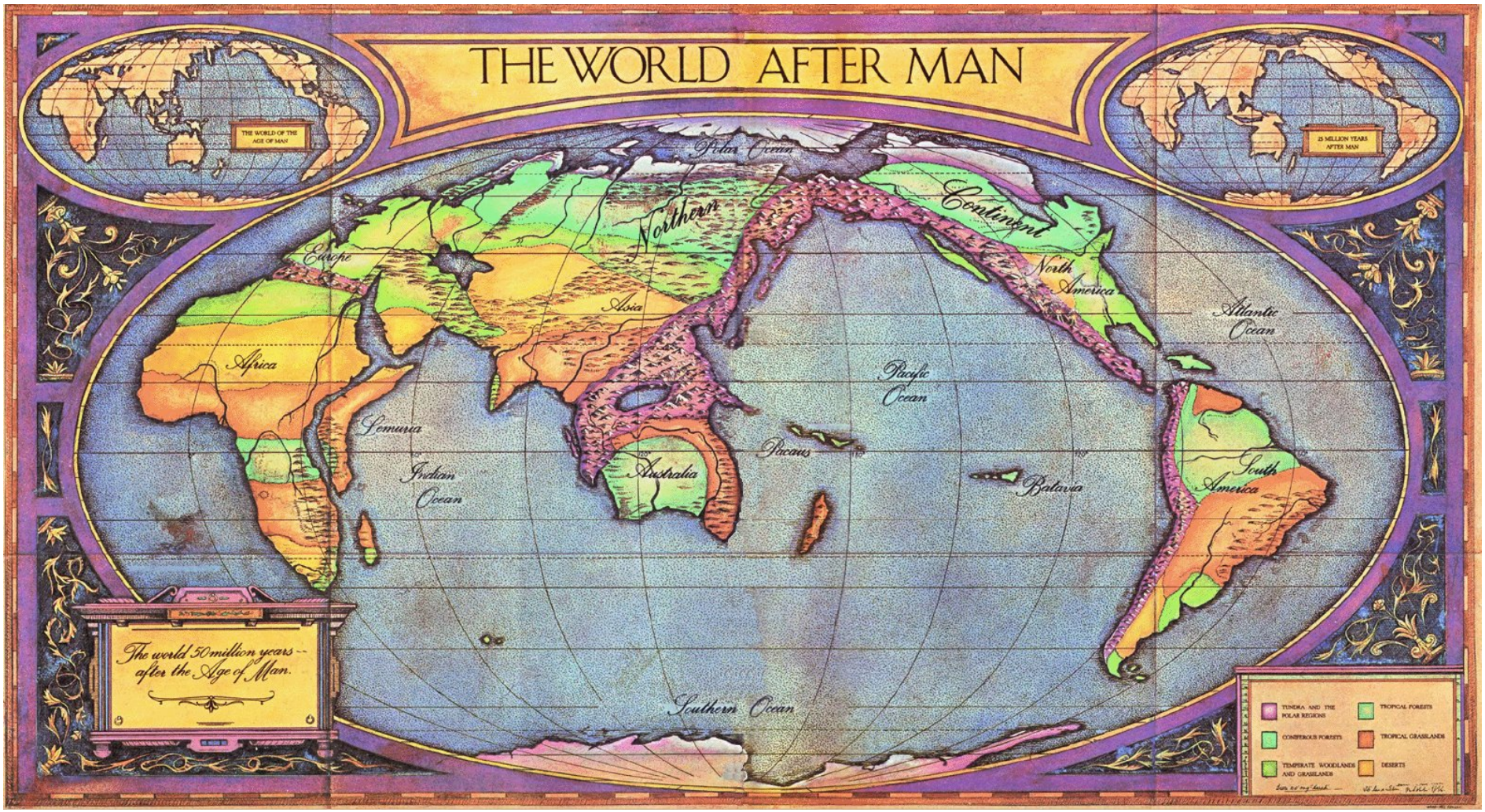
Two main assumptions

- No big mammals left: exterminated by humans
- Humans just disappeared from Earth

Some results

- Rodents and hares will radiate and fill niches of big hoofed mammals and their predators
- In many places, previously “neglected” groups will fill new ecological niches

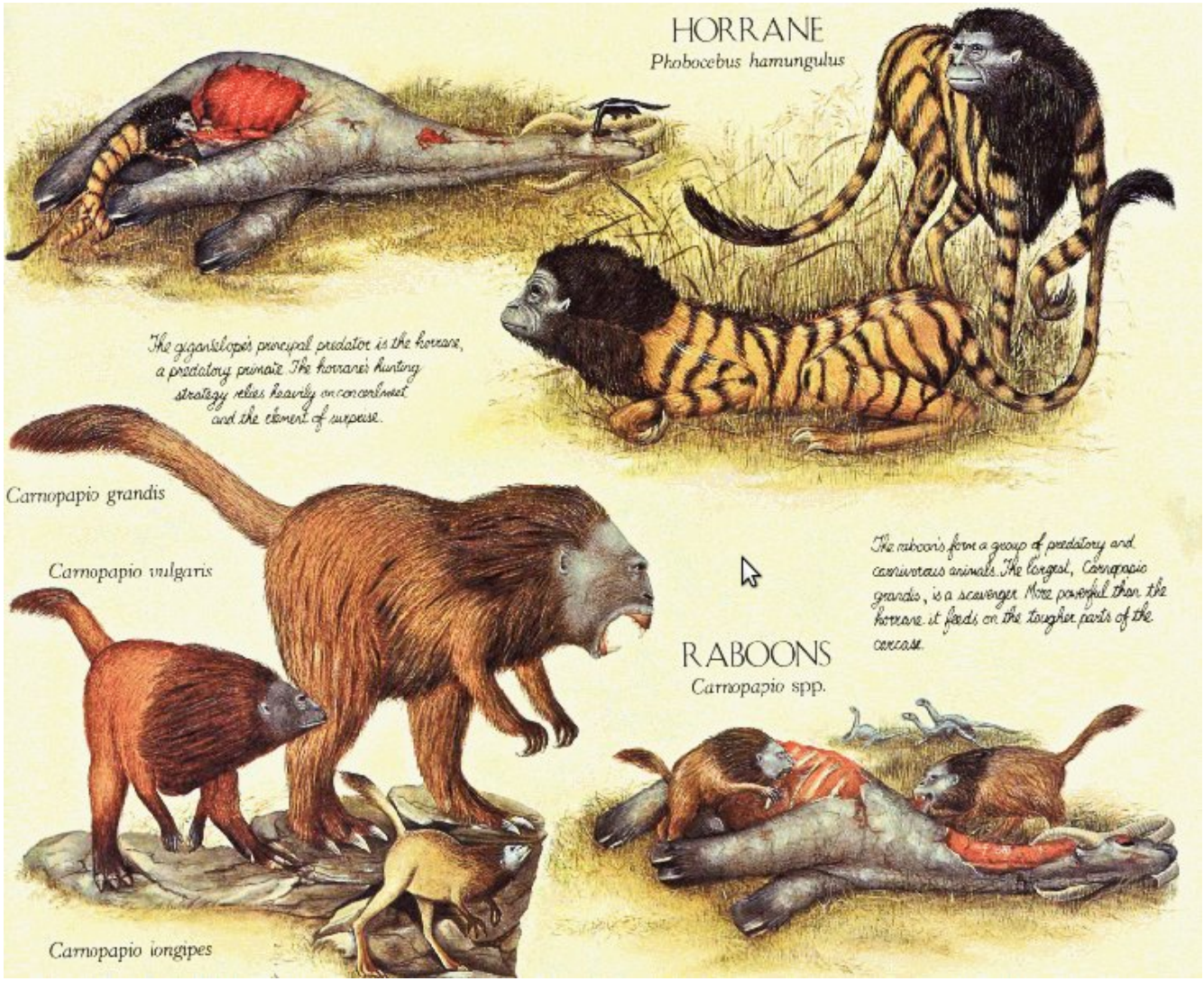
World in 50 million years



“Hoofed hares” and “wolf rats”

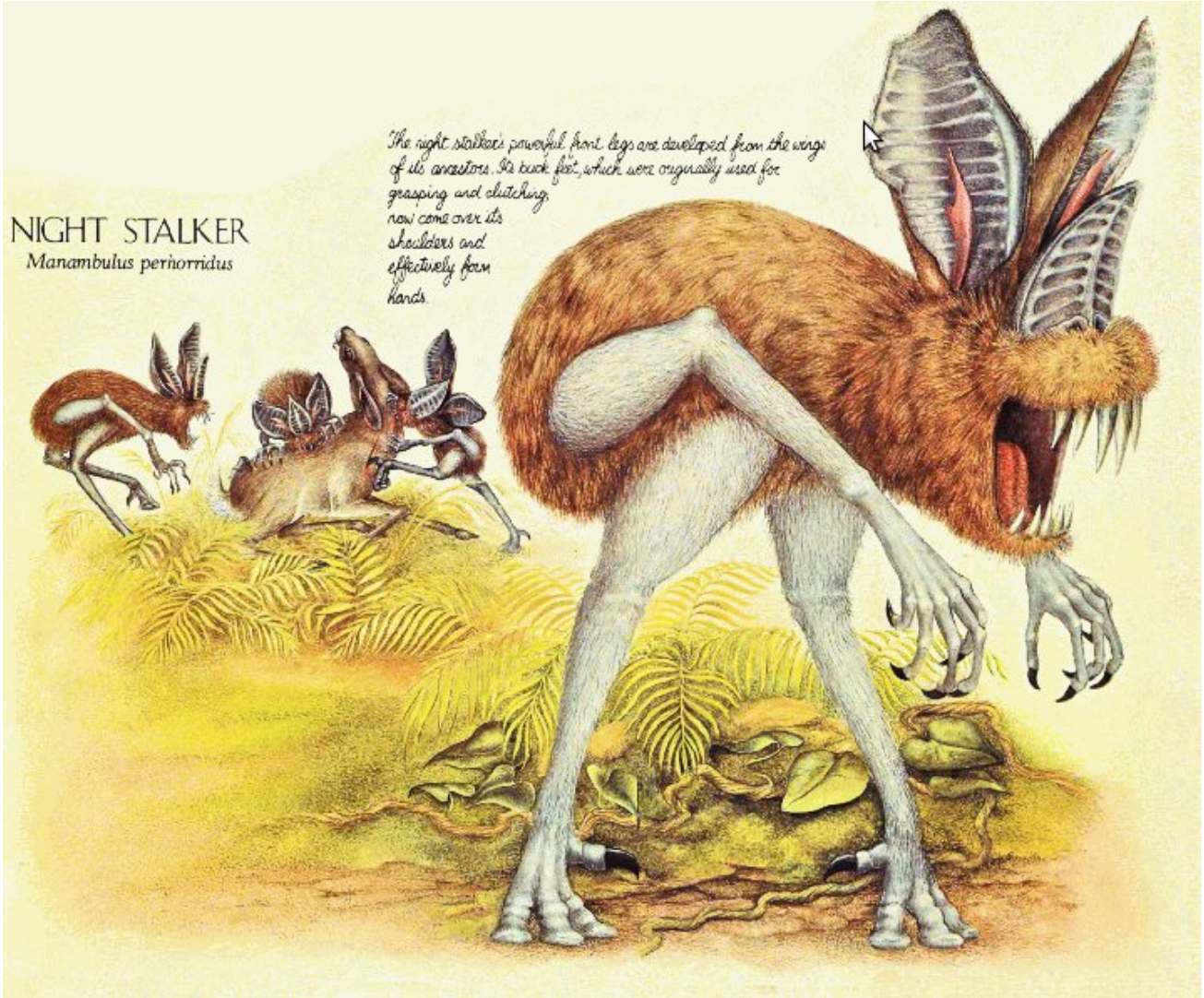
Tropical “monkey cat”

Carnivorous primates

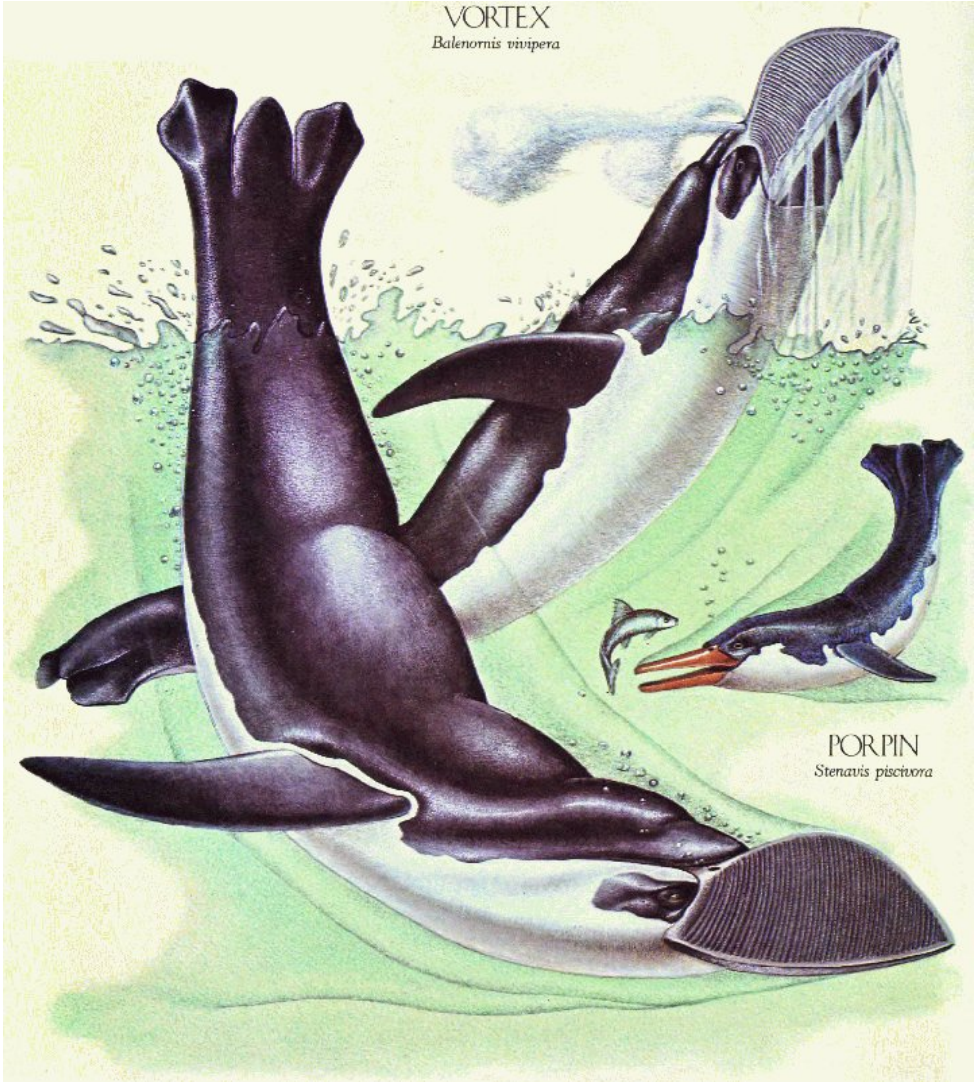


Mammal ectoparasite

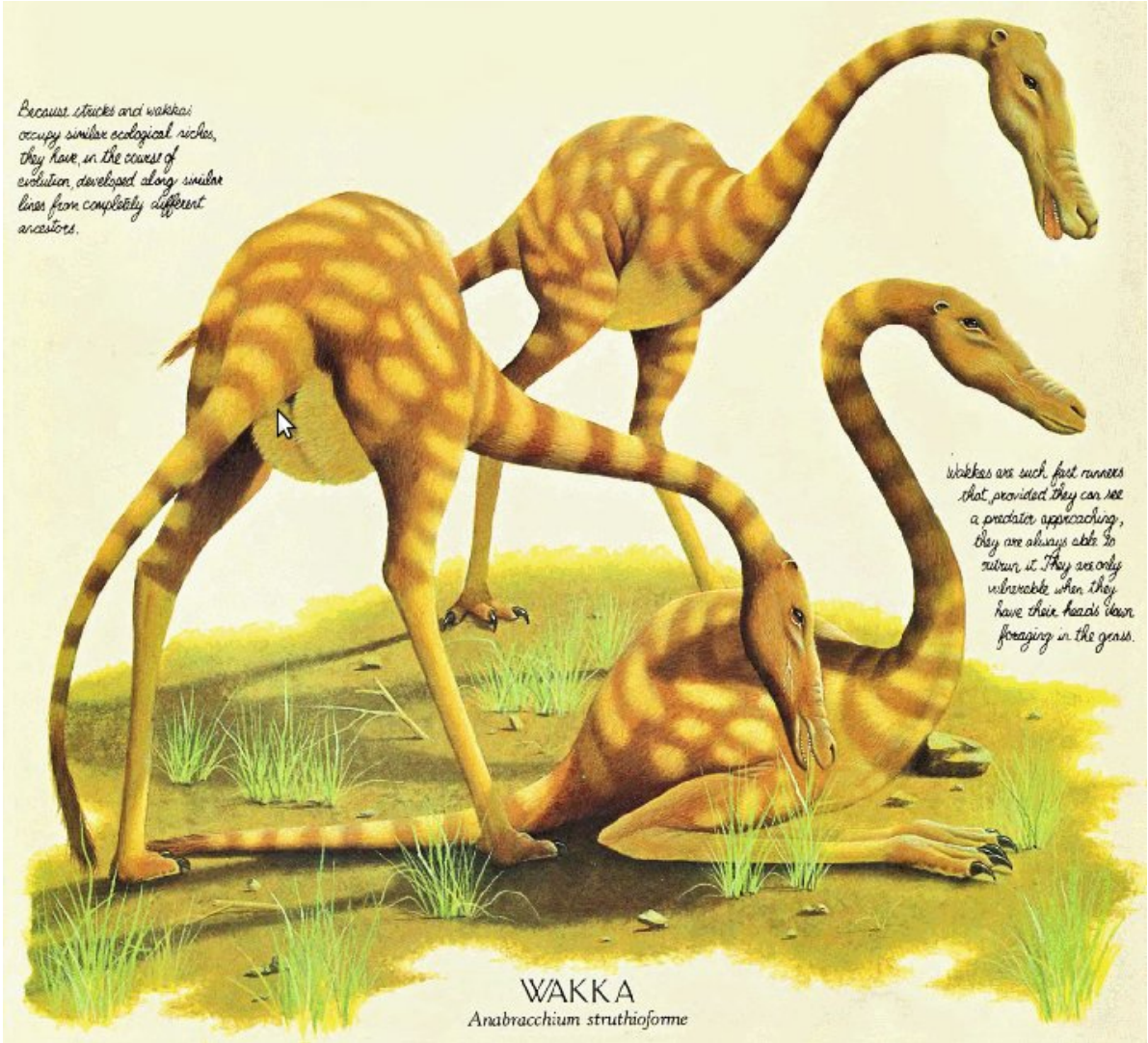
Oceanian terrestrial bats



Penguin whale



Bipedal mammal herbivore



Short anonymous absolutely voluntary survey

A. What do you **like** most in Biology 111?
B. What do you **dislike** most in Biology 111?
C. **Which lab** do you remember most of all?
D. Please grade (1—bad, 5—excellent):
    A. Lectures
    B. Labs
    C. Exams
E. **How** to improve textbook?

For Further Reading

Great American Interchange.
http://en.wikipedia.org/wiki/Great_American_Interchange

Ecogeography.
http://en.wikipedia.org/wiki/Biome

Human evolution.
http://en.wikipedia.org/wiki/Human_evolution

Homo.
http://en.wikipedia.org/wiki/Homo

D. Dixon. After man. Zoology of the Future