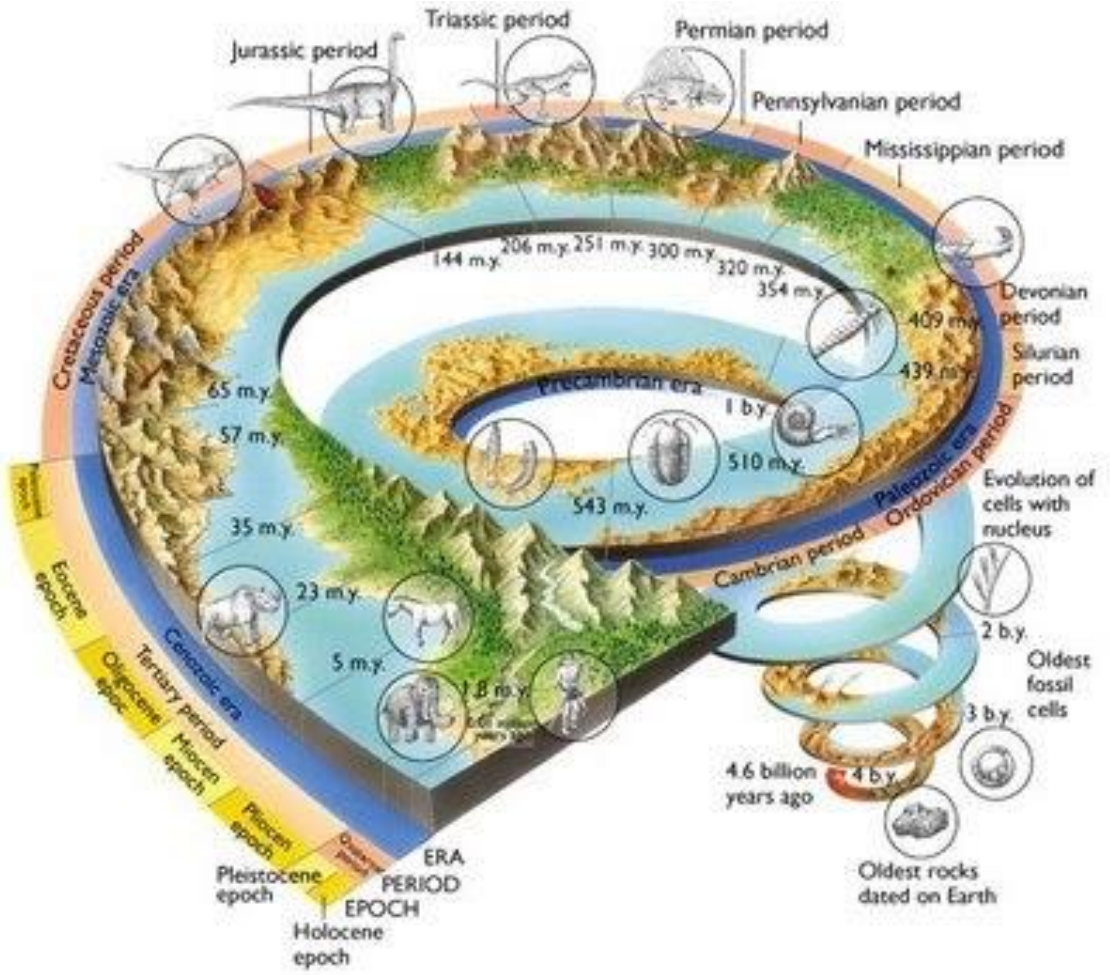
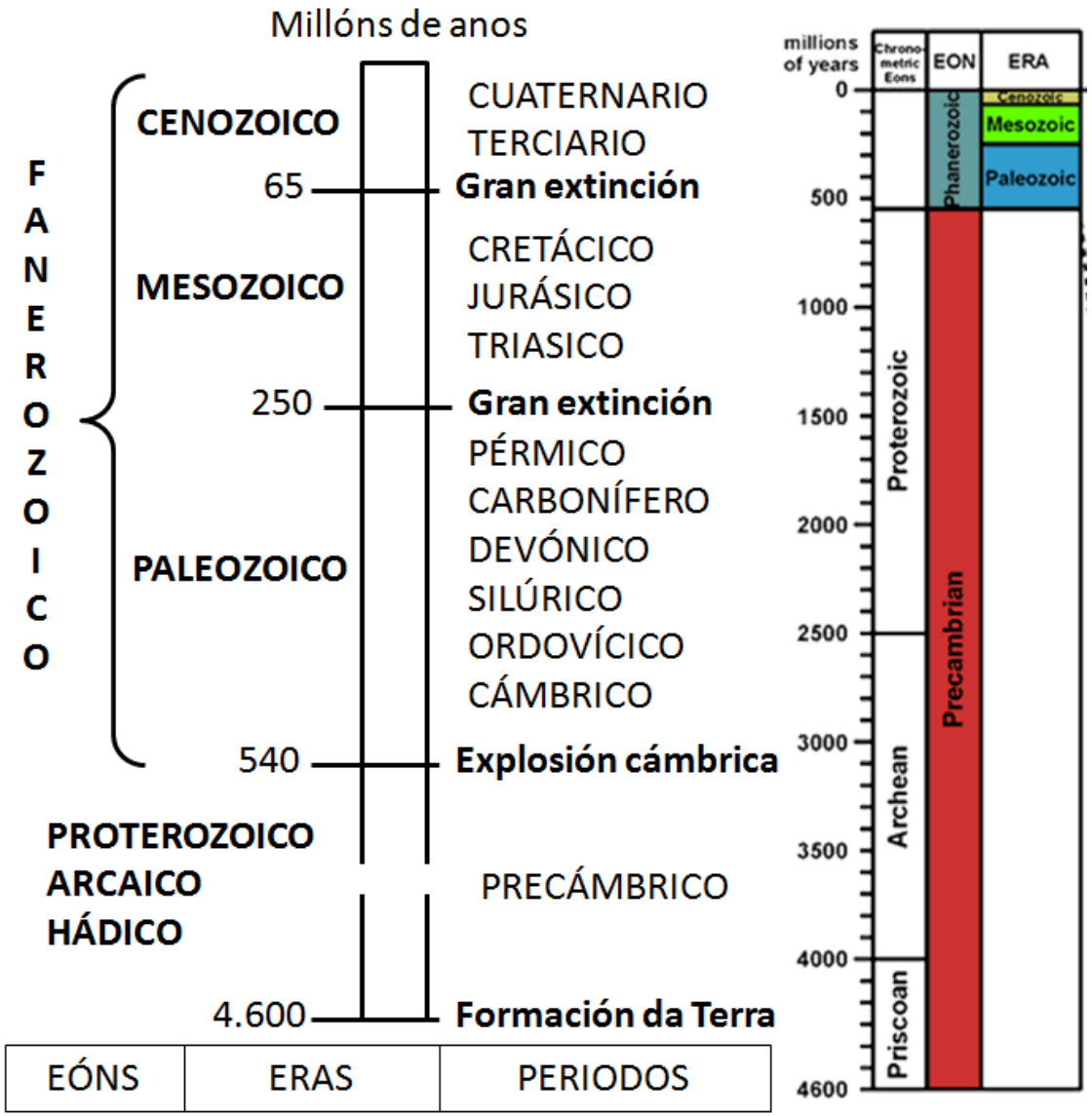
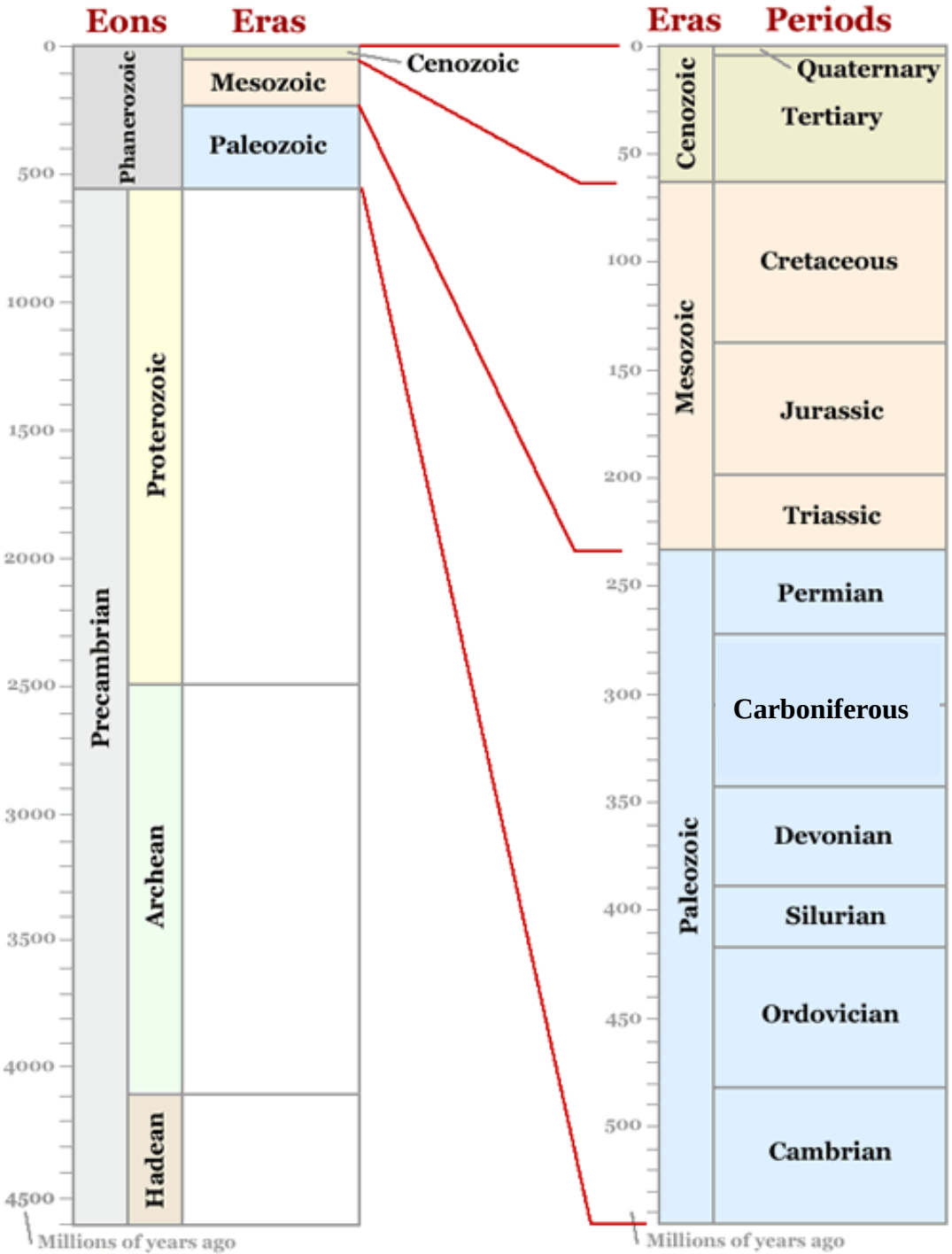
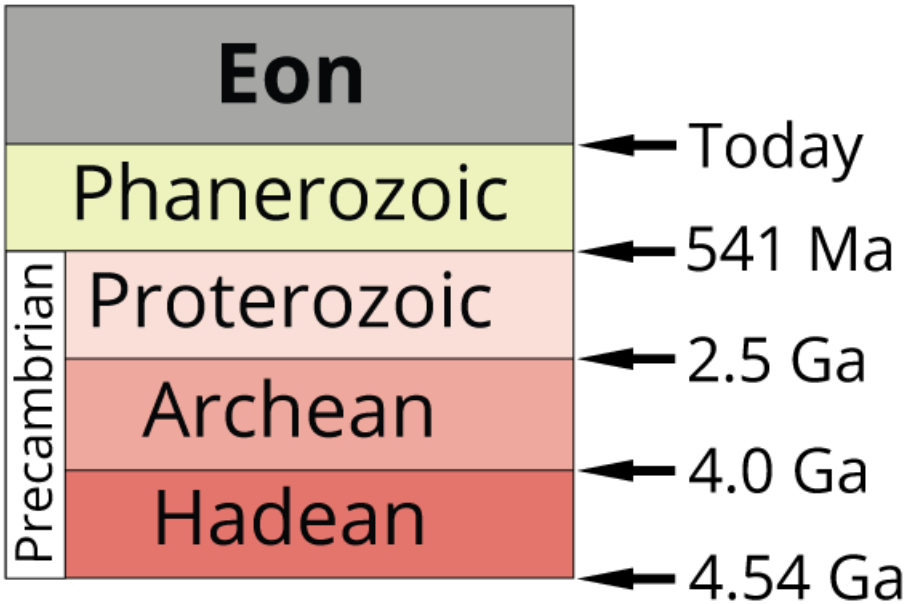


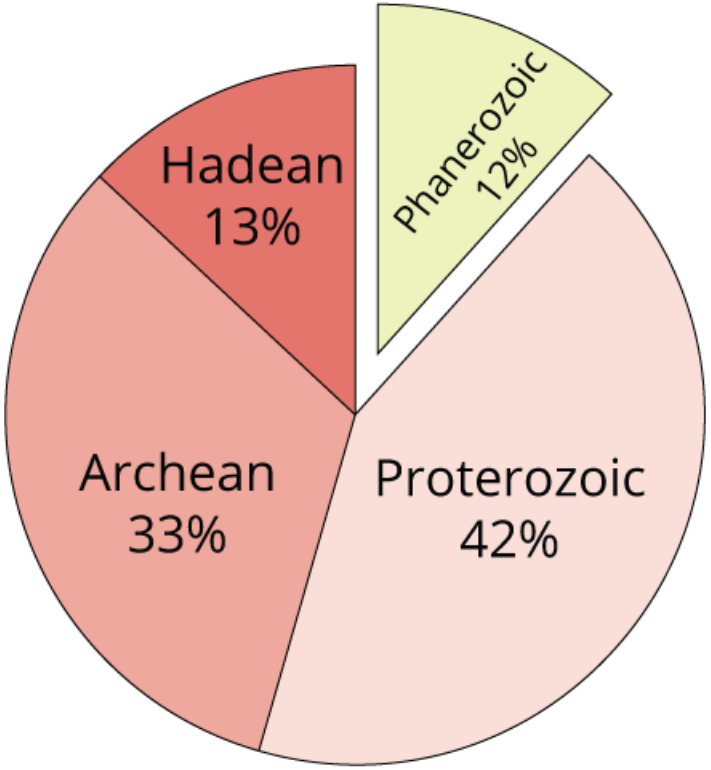
Tema 9: **Historia da Terra**

O CADRO DO TEMPO XEOLÓXICO

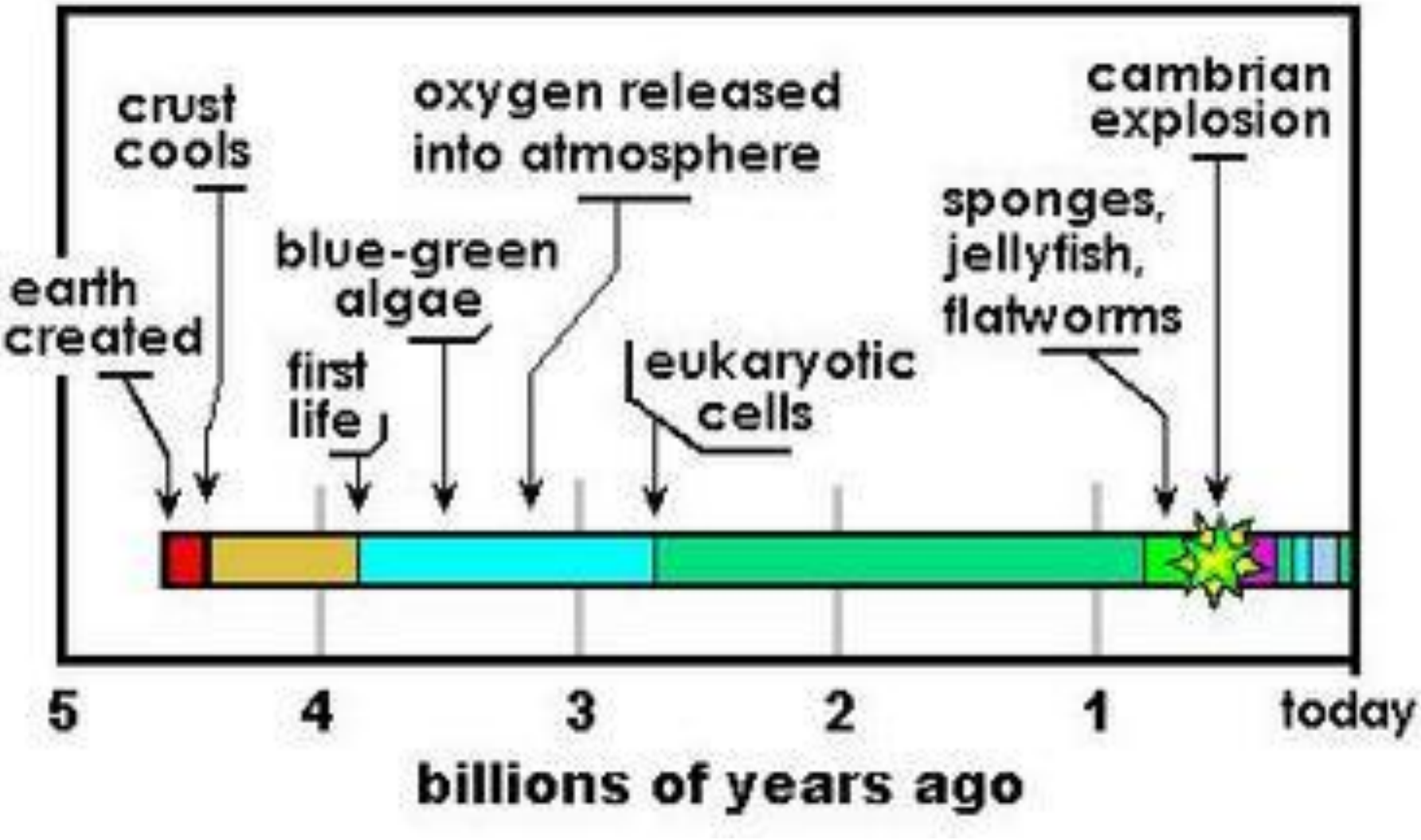



Eons
Eras
Eras
Periods
Phanerozoic
Precambrian
Proterozoic
Archean
Hadean
Cenozoic
Mesozoic
Paleozoic
Cenozoic
Quaternary
Tertiary
Mesozoic
Cretaceous
Jurassic
Triassic
Paleozoic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
0
500
1000
1500
2000
2500
3000
3500
4000
4500
0
50
100
150
200
250
300
350
400
450
500
Millions of years ago
Millions of years ago

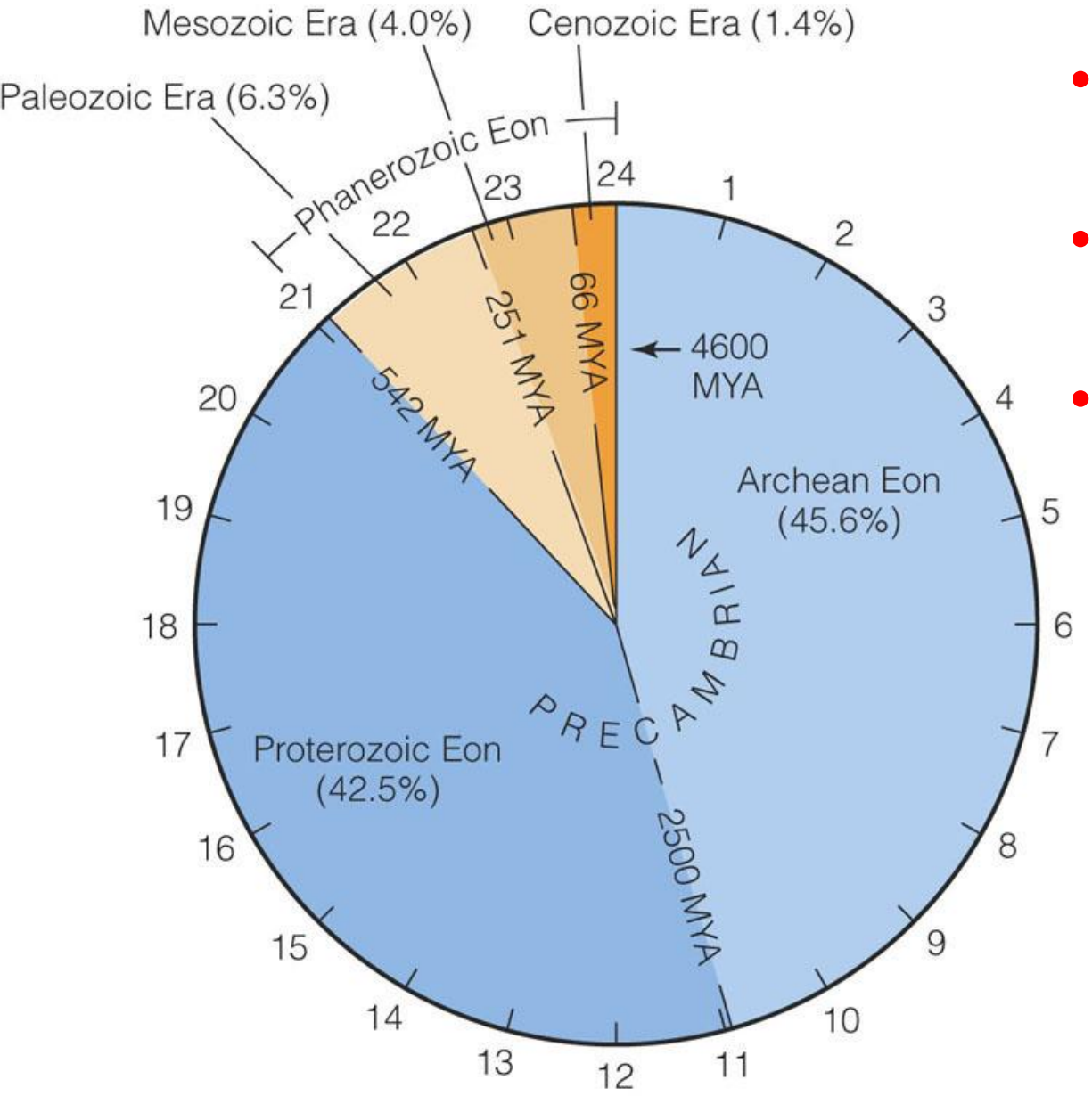

Eon
Phanerozoic
Proterozoic
Archean
Hadean
Precambrian
Today
541 Ma
2.5 Ga
4.0 Ga
4.54 Ga


Hadean
13%
Phanerozoic
12%
Archean
33%
Proterozoic
42%

PRECÁMBRICO



Precámbrico



- 80% historia da Terra
- Ensamblaxe e rotura de supercontinentes
- Orixe da vida

ENSAMBLAXE E ROTURA DE SUPERCONTINENTES CANTOS ?

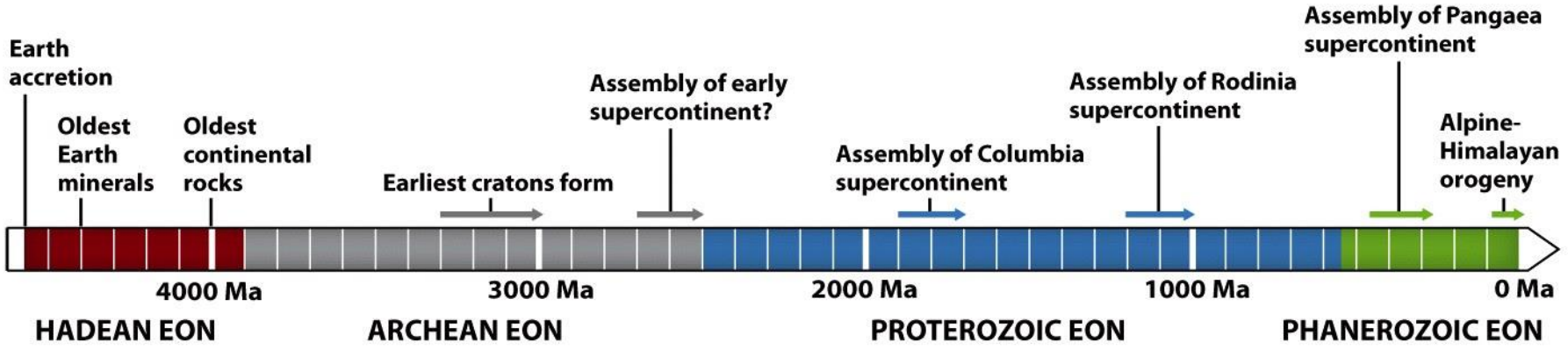
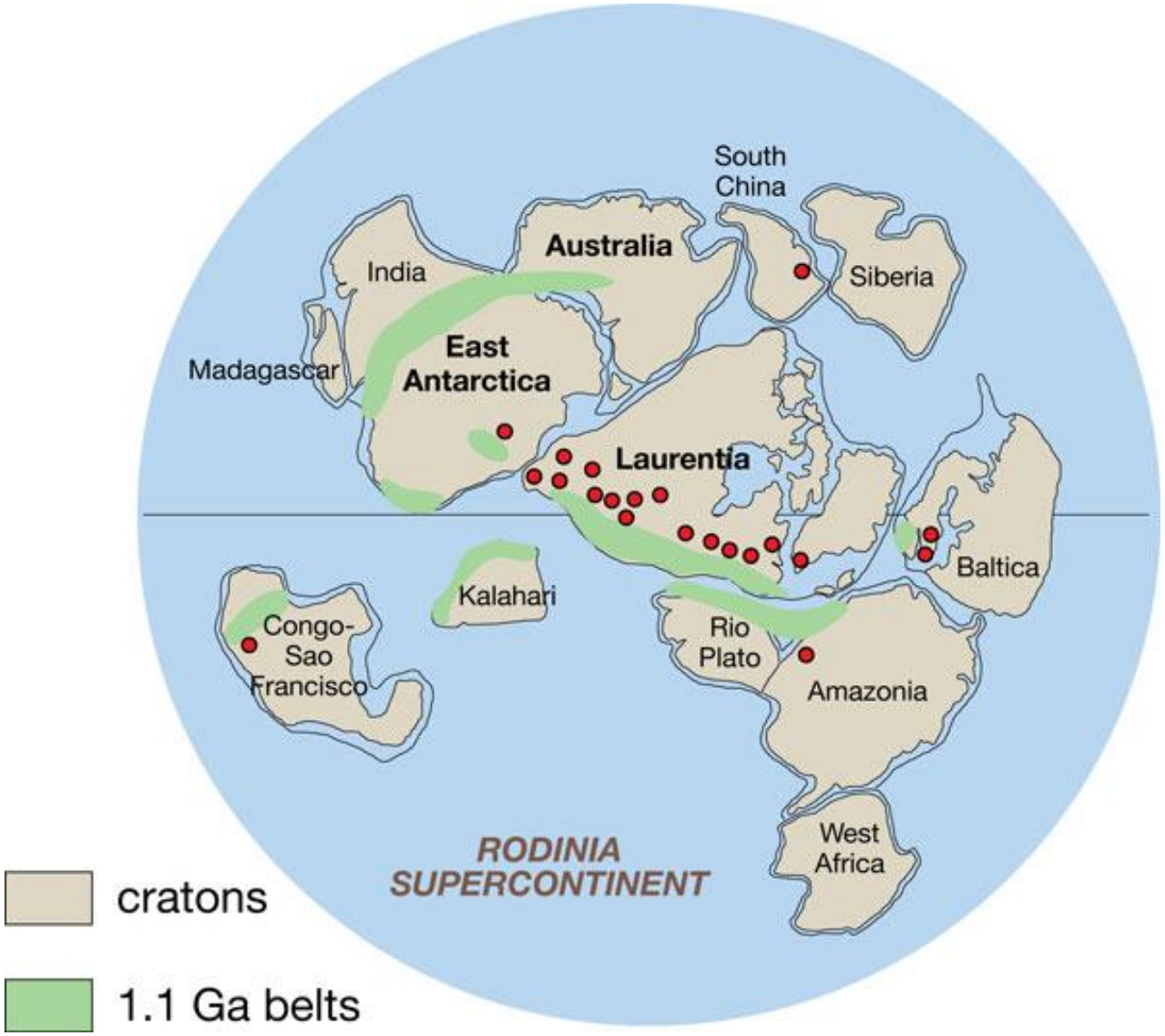


Figure 10.19
Understanding Earth, Sixth Edition

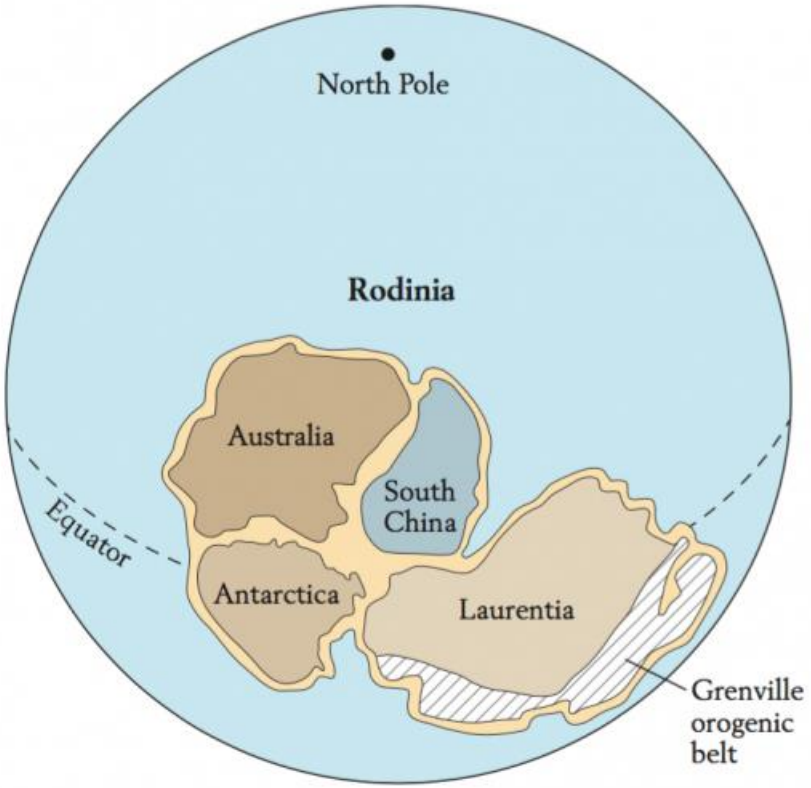
RODINIA hai 1000 m.a.

Oroxenia Grenville

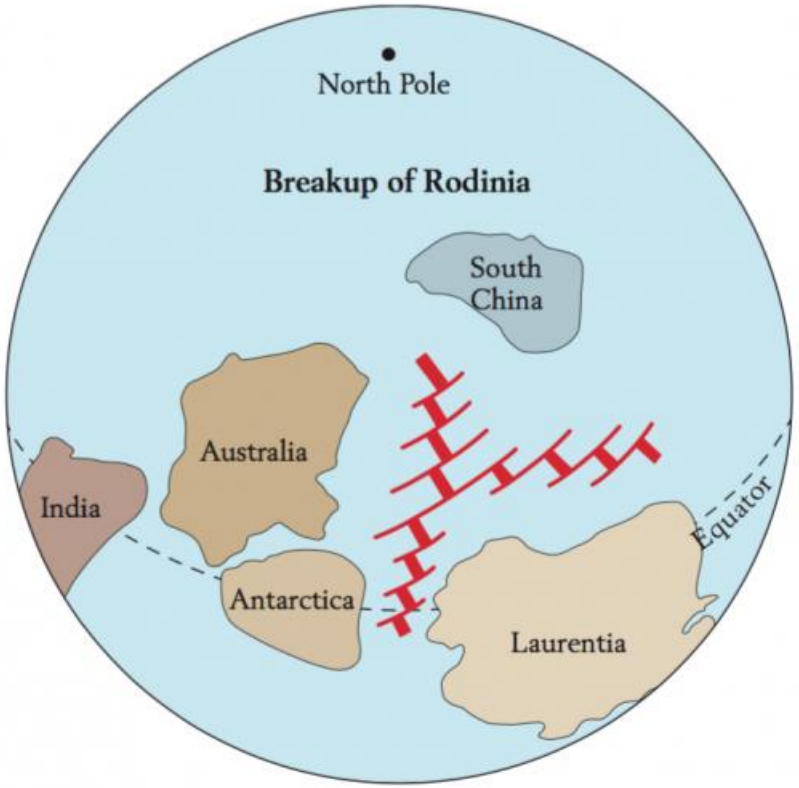
RECONSTRUCIÓN DE RODINIA



FRAGMENTACIÓN DE RODINIA



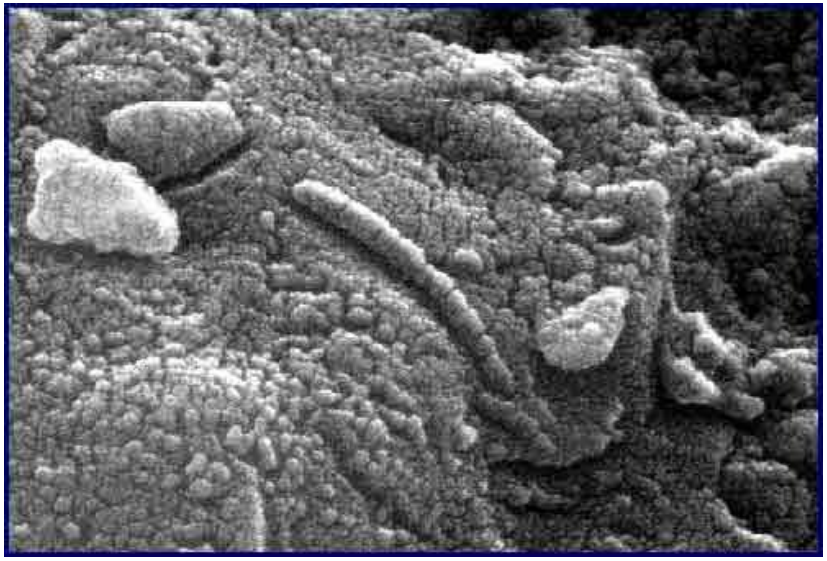
A 800 million years ago

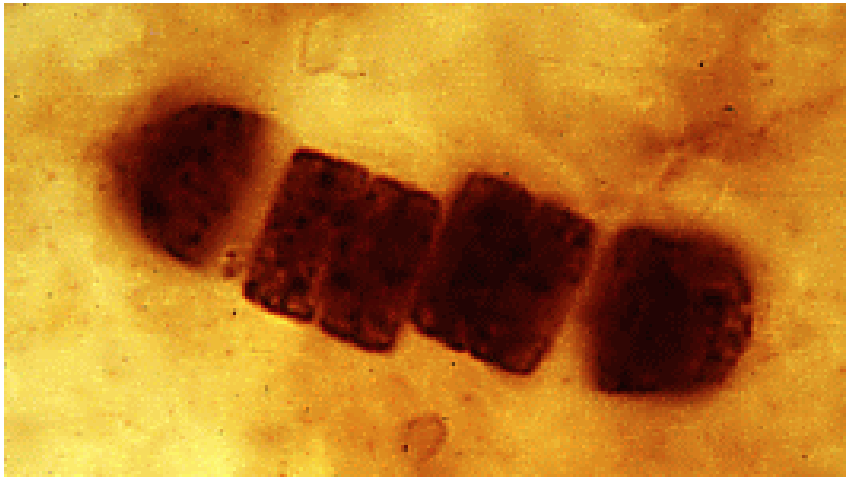


B 650 million years ago

Fósiles máis antigos

Bacterias de 3.500 – 3.800 millóns de anos



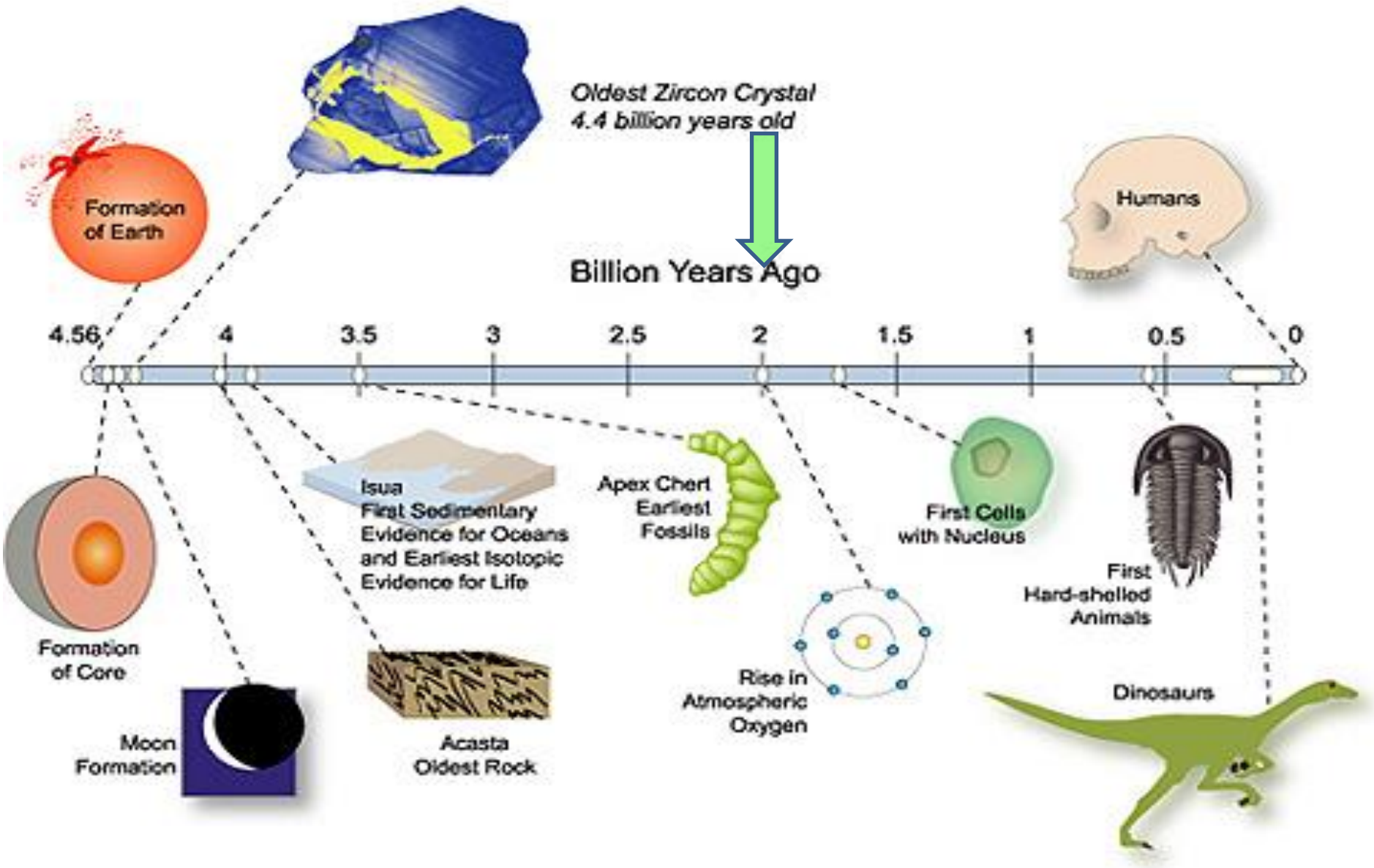


Oldest traces of life: 3.5 – 3.8 billion years old. Very few rocks available of this age or older.

Estromatolitos

Estromatolitos actuais

Aparición da fotosíntese e atmosfera con osíxeno



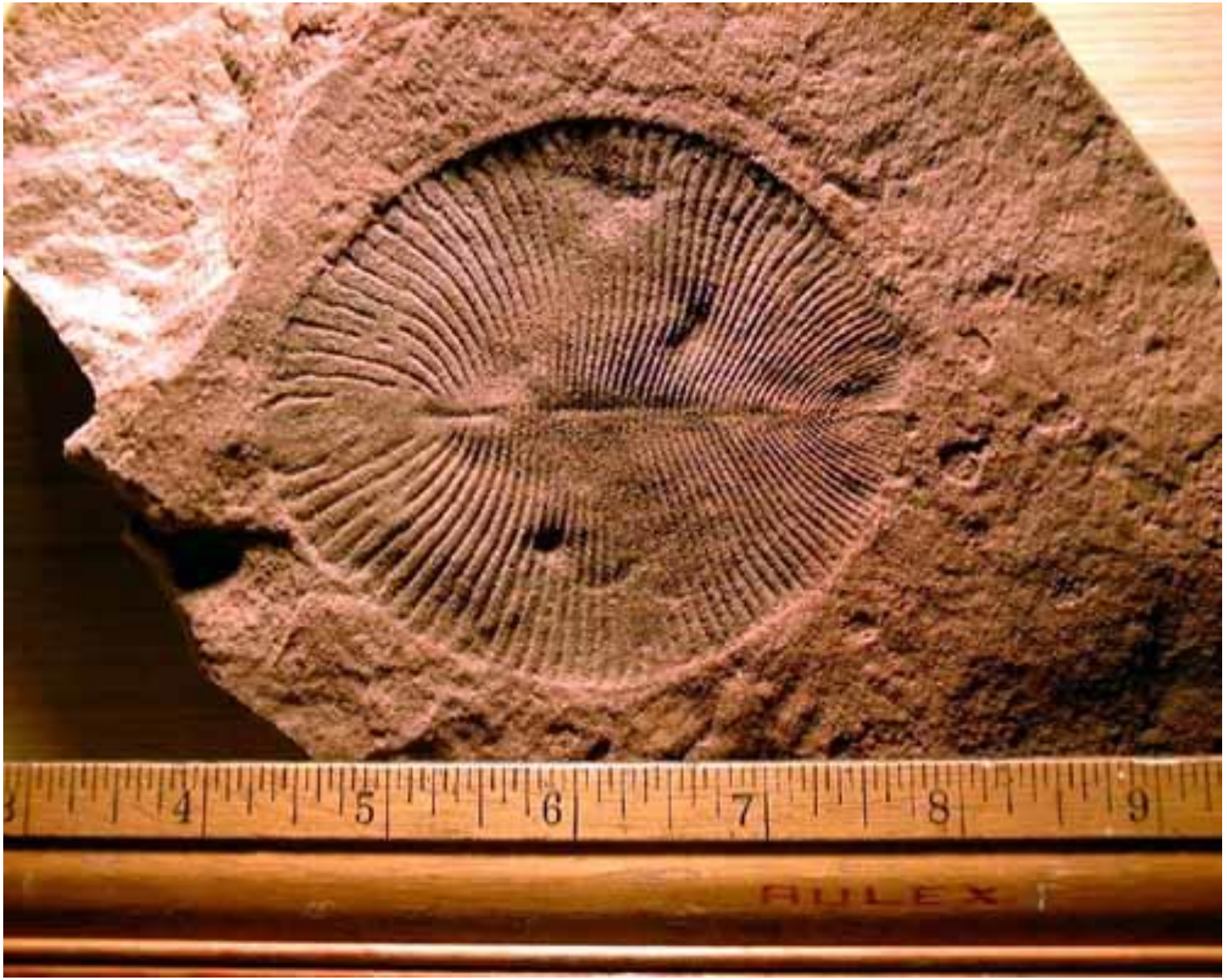
Primeiros organismos pluricelulares

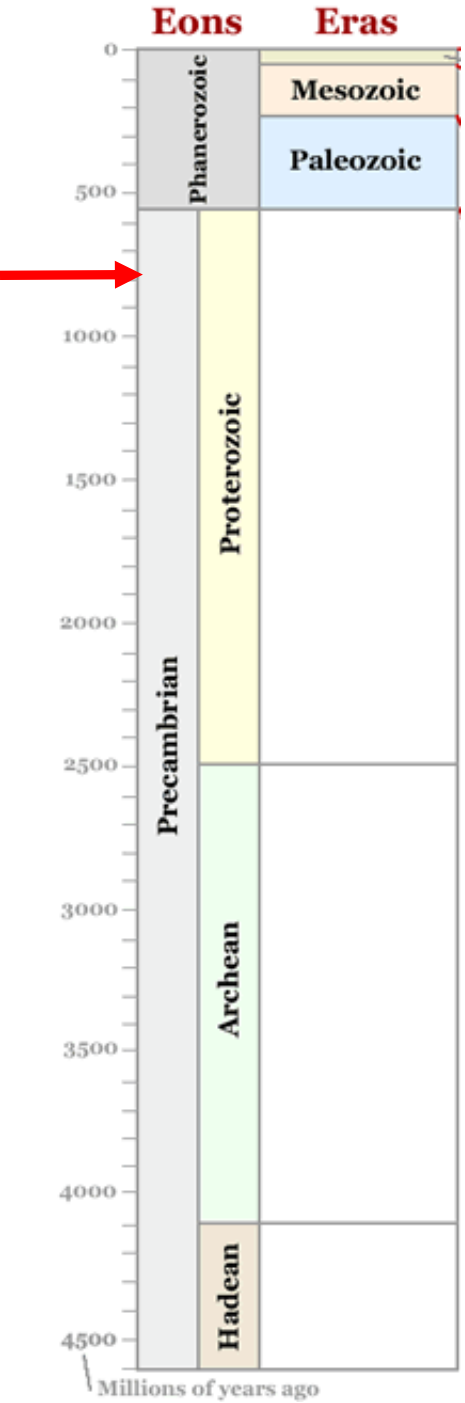
EDIACARAN FAUNA

Earliest metazoan (animal) fossils
Precambrian ~600-570 mya

named for Australia's Ediacara hills where first discovered- now known to occur worldwide

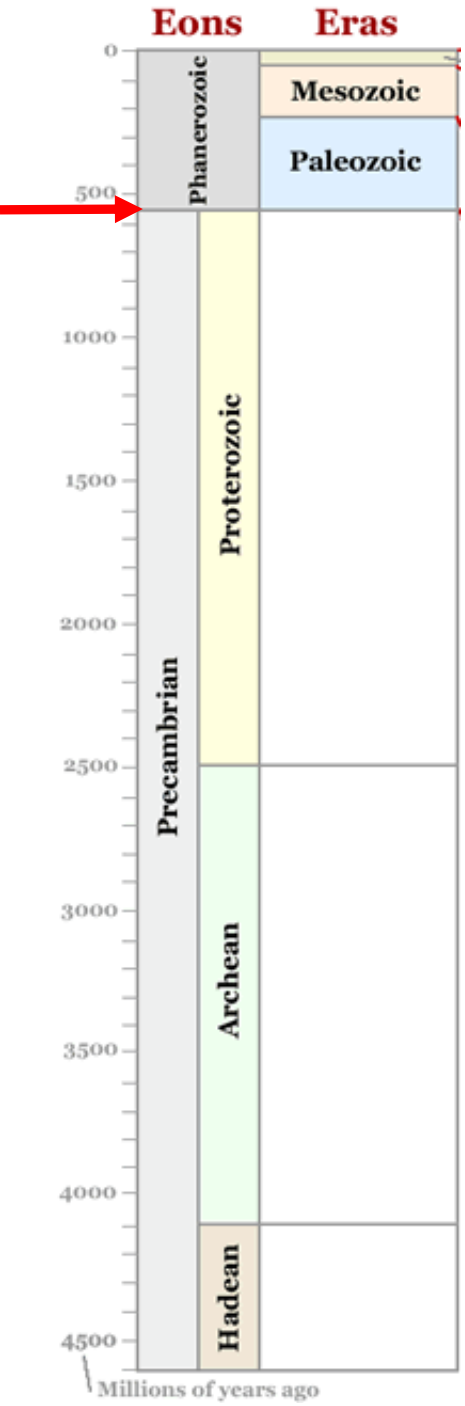
Dickinsonia *from Ediacara Hills*





Ediacaran Fauna

- Dates to about 560 MYA.
- Are exclusively soft-bodied (sponges, jellyfish, comb jellies, etc) and non-burrowing.

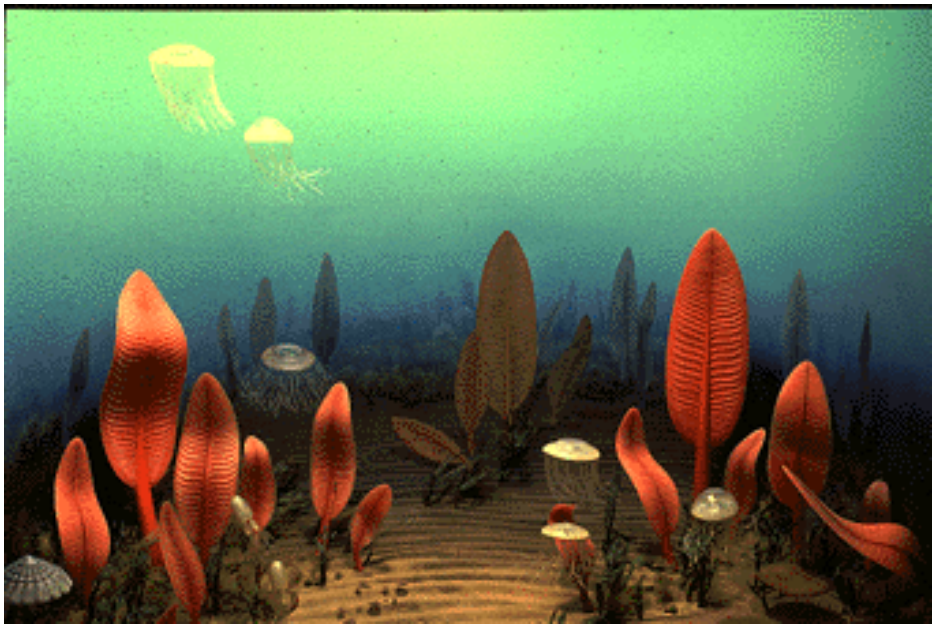


The Cambrian Explosion

- About 550 million years ago, there is a sudden appearance of large numbers of multicellular organisms in the fossil record. Rocks older than this appear devoid of fossils (because they are too small to see, and because the multicellular organisms didn't have hard parts to preserve.
- This sudden appearance of fossils is called the Cambrian explosion.
- Most of the higher level taxa present today appeared at this time.
- Cause: a matter of speculation. Probably triggered by a mass extinction.

CAMBRIAN EXPLOSIÓN

Ediacaran marine community



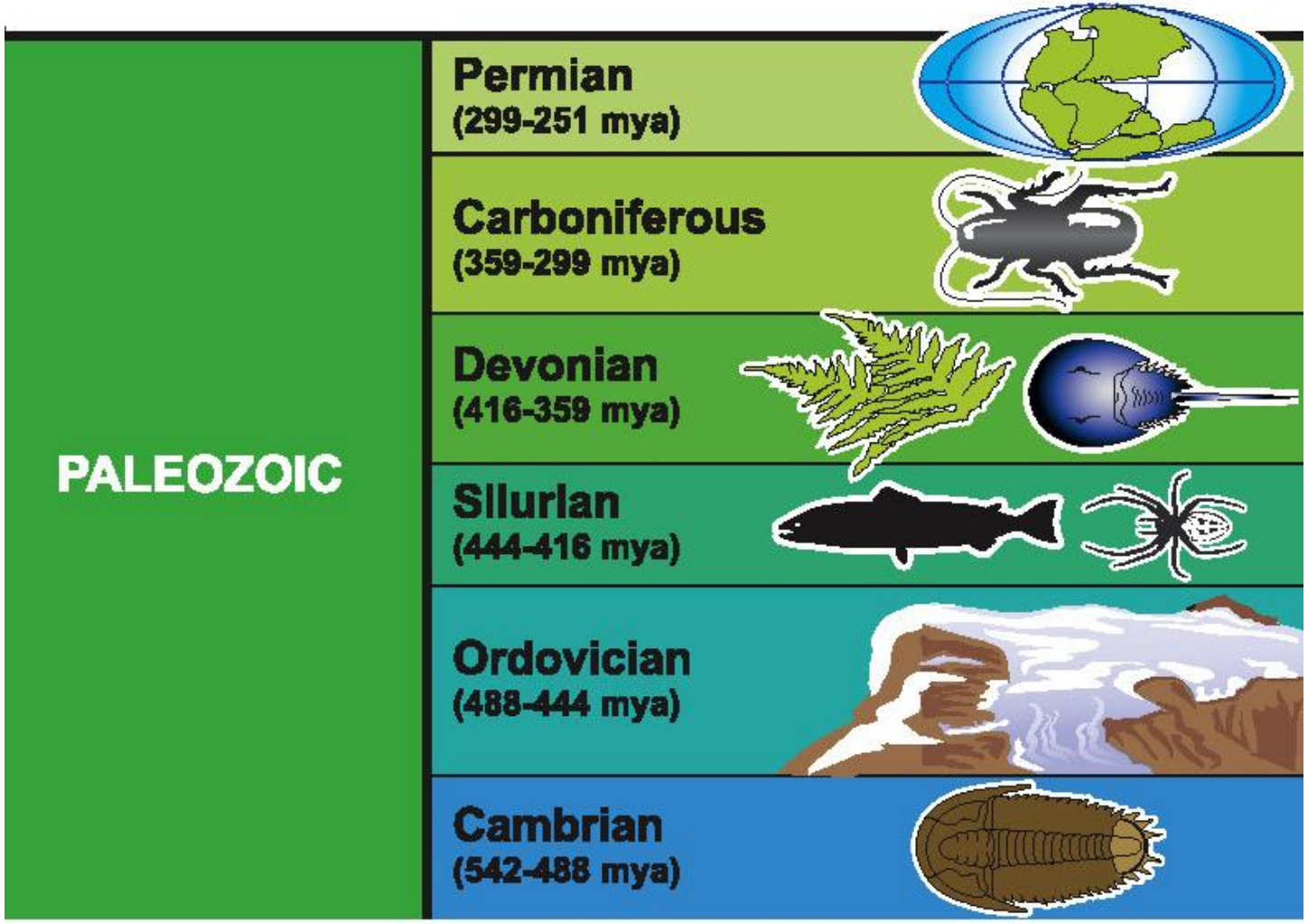
All suspension feeders (or at least passive food gatherers)

Cambrian marine community

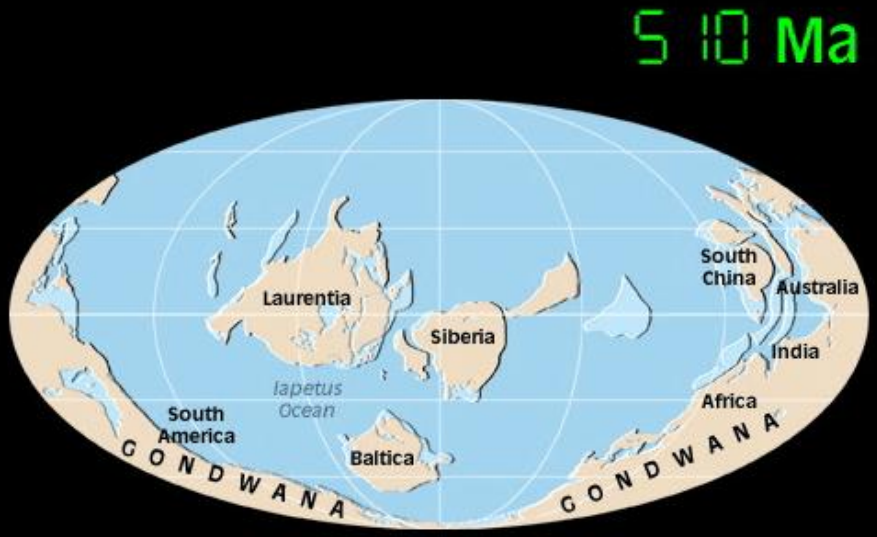
Carnivores
Suspension feeders
Deposit feeders

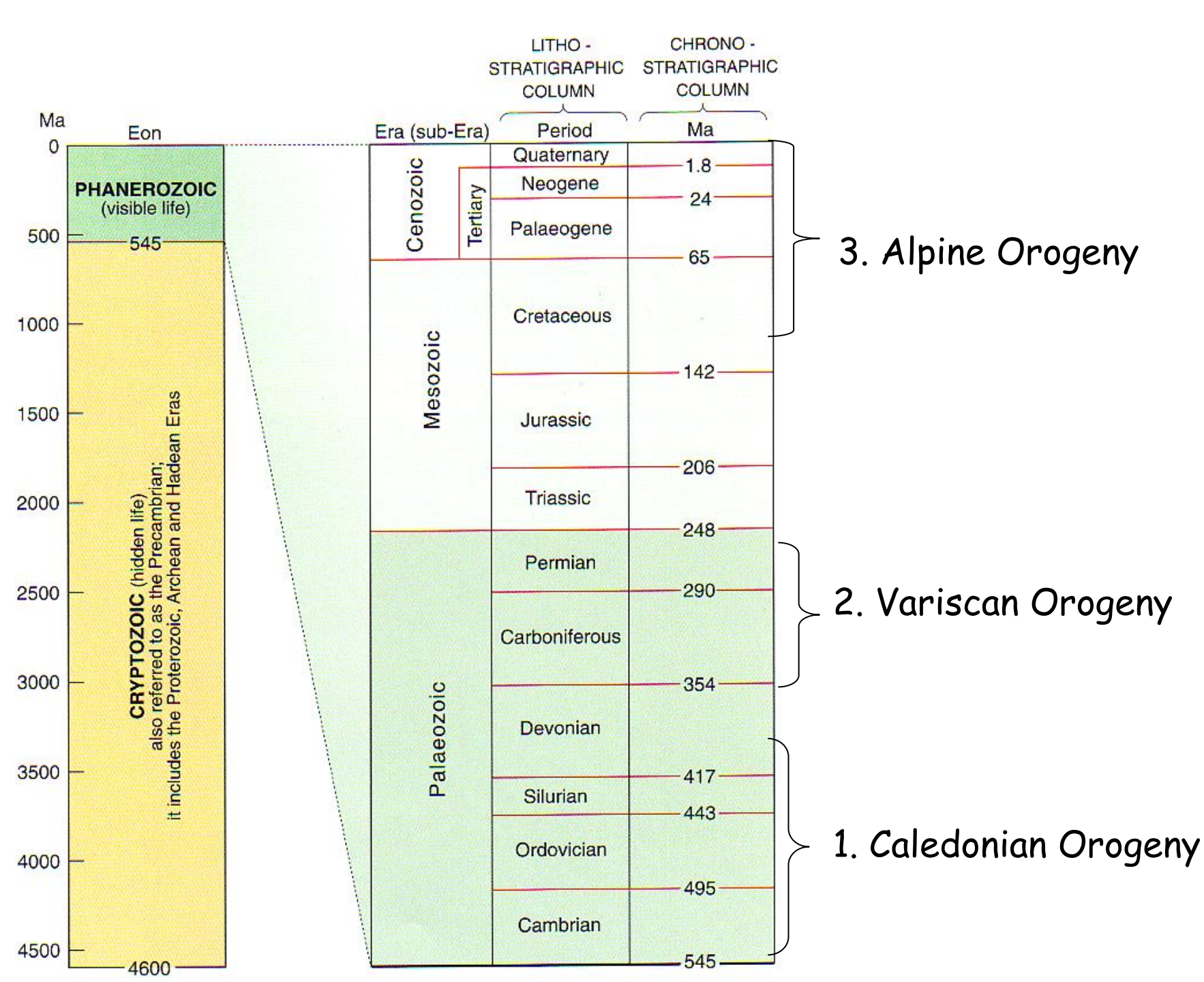
The first arms race !

PALEOZOICO

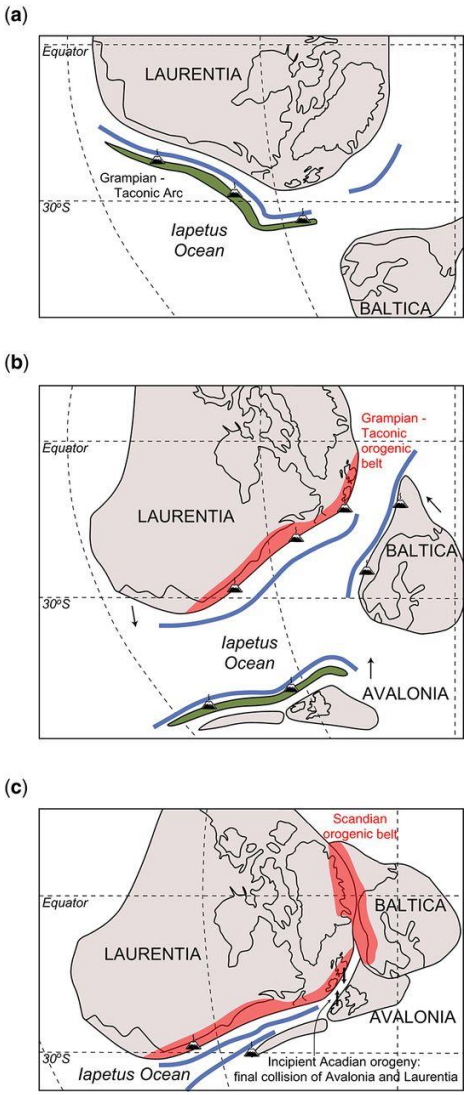

PALEOZOIC
Permian
(299-251 mya)
Carboniferous
(359-299 mya)
Devonian
(416-359 mya)
Silurian
(444-416 mya)
Ordovician
(488-444 mya)
Cambrian
(542-488 mya)

FORMACIÓN DA PANXEA



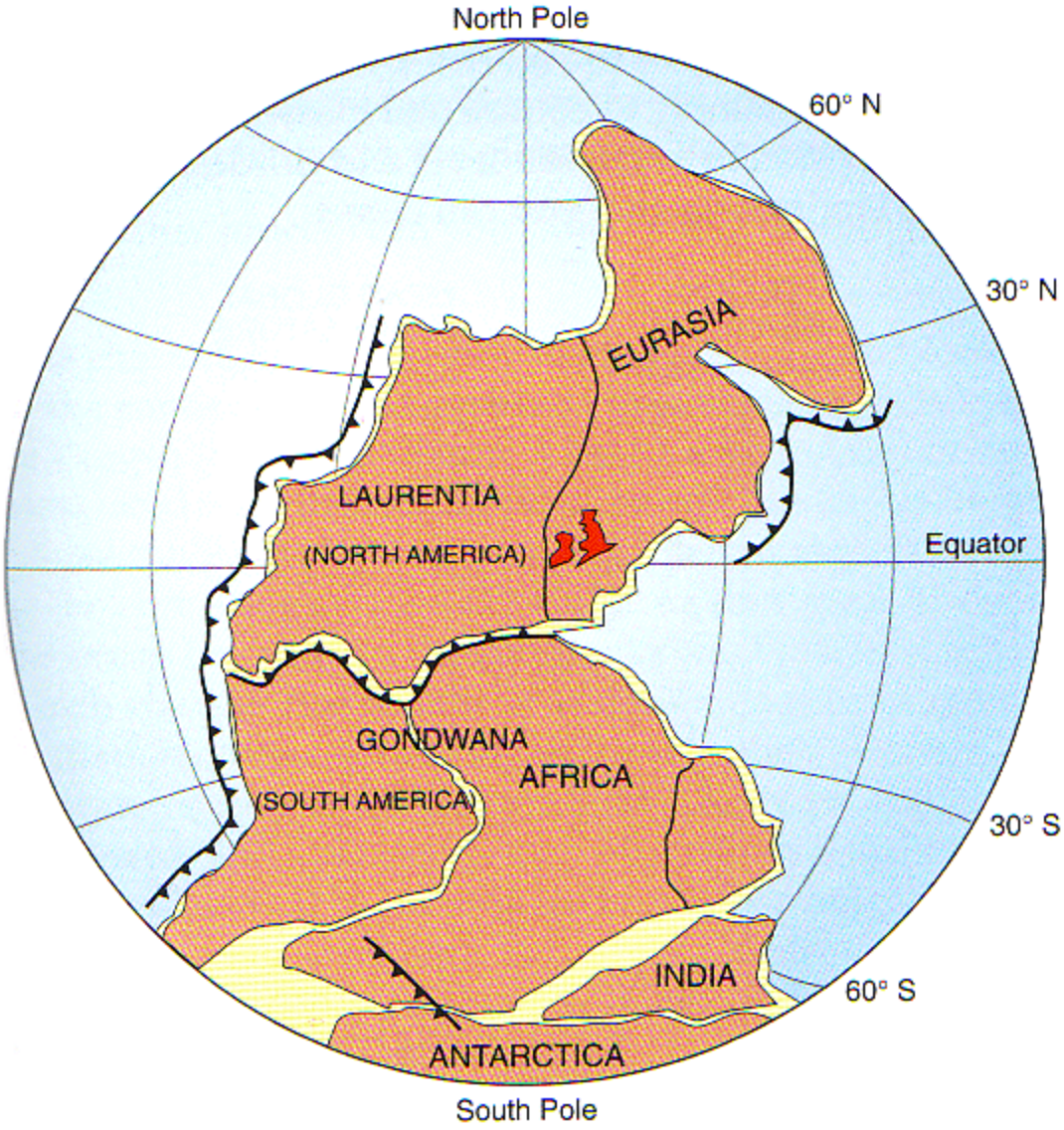

LITHO - STRATIGRAPHIC COLUMN
CHRONO - STRATIGRAPHIC COLUMN
Ma
Eon
Era (sub-Era)
Period
Ma
0
PHANEROZOIC
(visible life)
500
545
1000
1500
2000
2500
3000
3500
4000
4500
4600
CRYPTOZOIC (hidden life)
also referred to as the Precambrian;
it includes the Proterozoic, Archean and Hadean Eras
Cenozoic
Tertiary
Quaternary
Neogene
Palaeogene
Mesozoic
Cretaceous
Jurassic
Triassic
Palaeozoic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
1.8
24
65
142
206
248
290
354
417
443
495
545
3. Alpine Orogeny
2. Variscan Orogeny
1. Caledonian Orogeny

OROXENIA CALEDONIANA

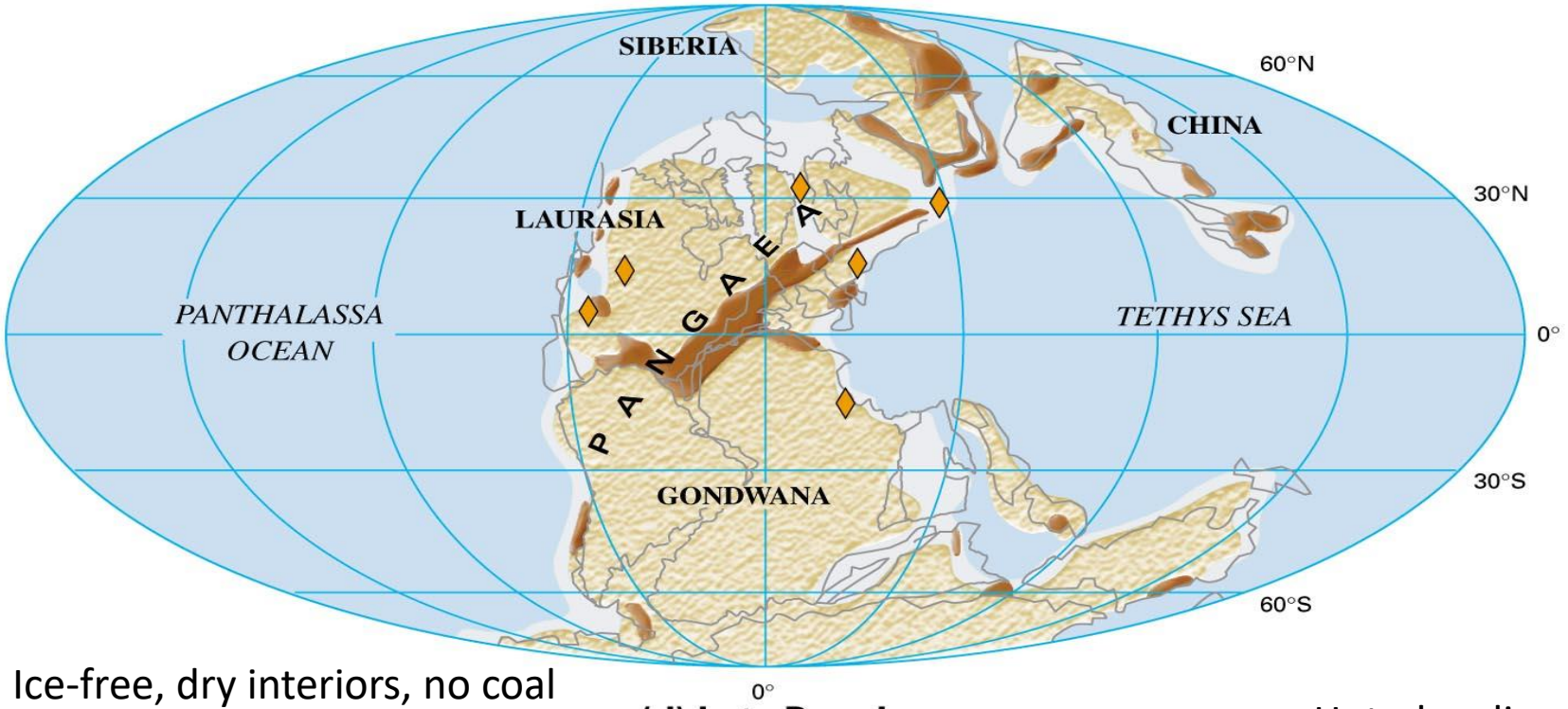


OROXENIA HERCÍNICA

Mid-Devonian ~400 Ma



Carboniferous ~300 Ma



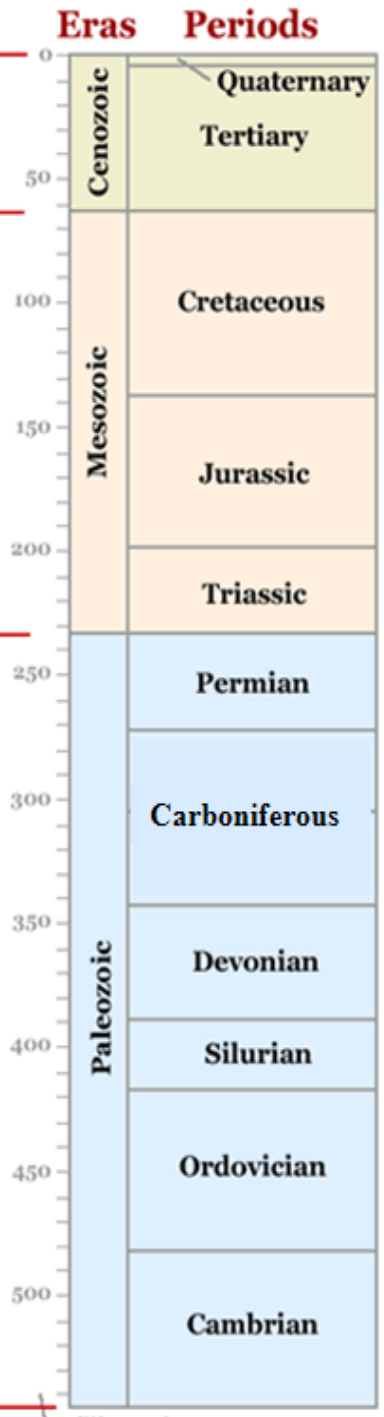
Ice-free, dry interiors, no coal
Much of land +/- 30 degrees

Hot, dry climate
Note evaporites

Pangaea is assembled, sea-level low

Early Permian (270 Ma)

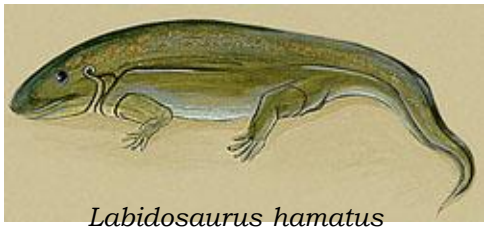
The end product of these episodes of continental convergence was the supercontinent of Pangaea.



Life in Paleozoic Era

"old life" 570 – 245 million years ago

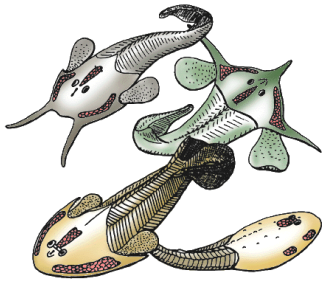
Carboniferous:
First reptiles
http://www.bluesci.org

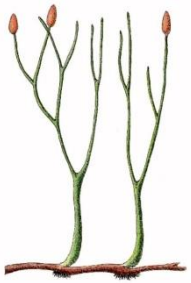


Labidosaurus hamatus

Devonian:
First amphibians
http://www.exploratorium.edu

Ichthyostega

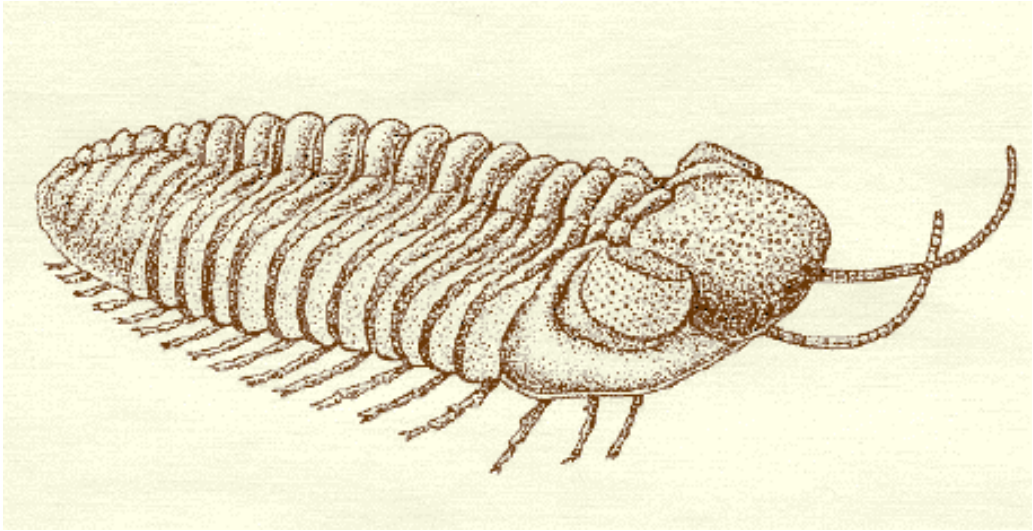




Silurian:
First fish &
land plants http://tolweb.org http://ww.cavehill.uwi.edu

Ordovician:
Crinoids &
Starfish
http://www.oum.ox.ac.uk
http://museumvictoria.com.au

Cambrian:
Trilobites &
Sponges
http://www.fossilmuseum.net
http://www.palaentology.geo.uu.se



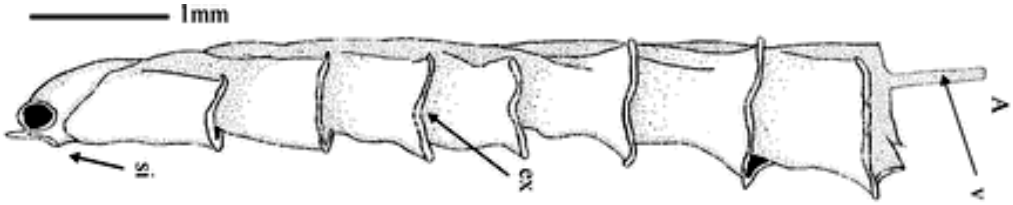
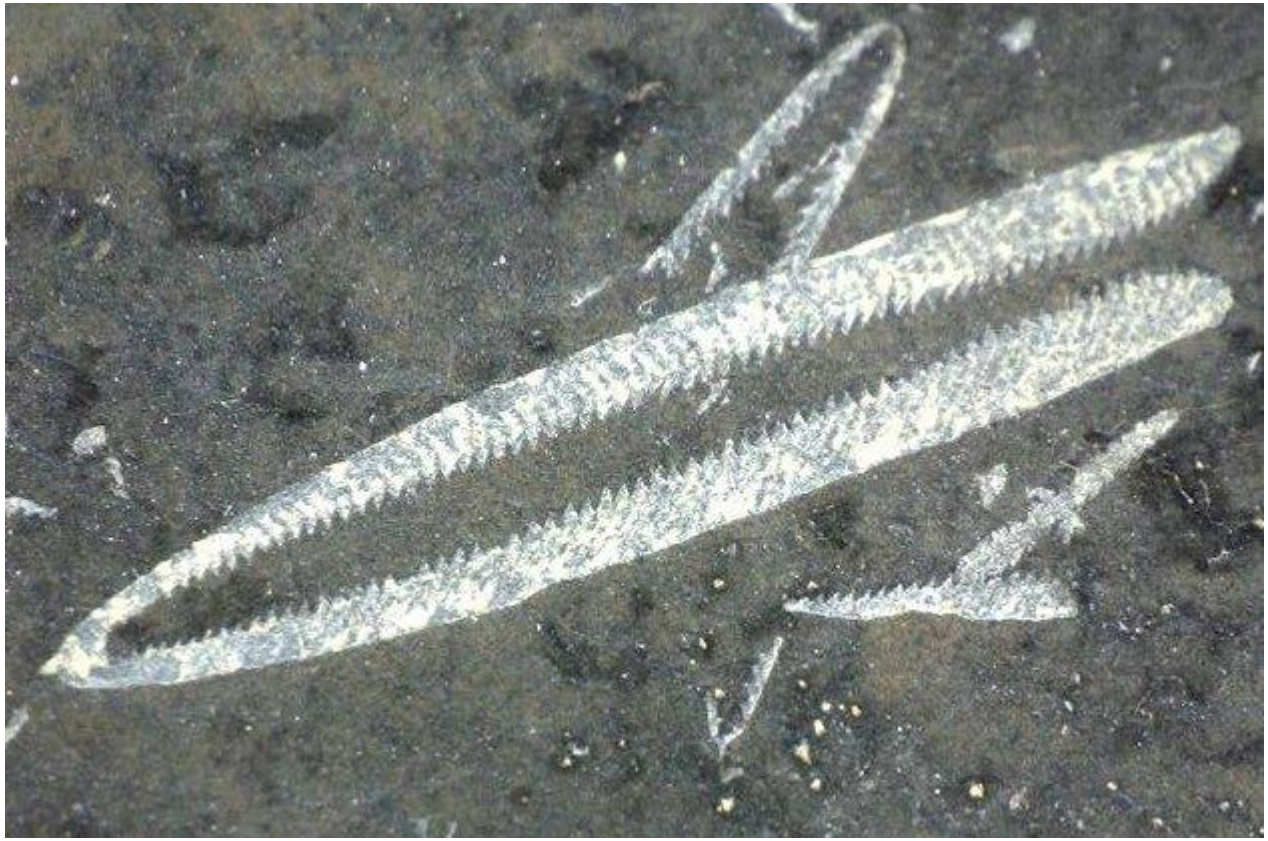
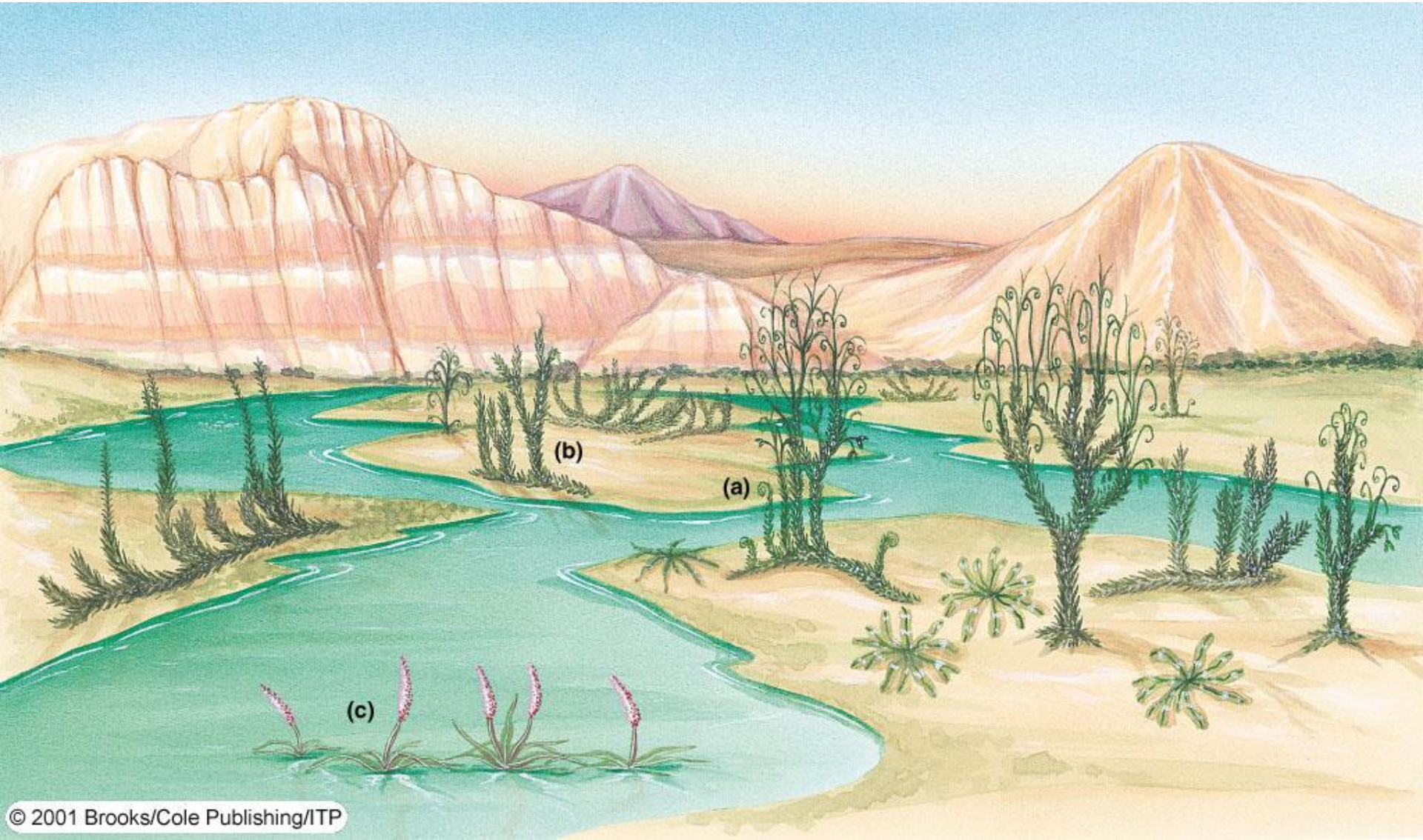


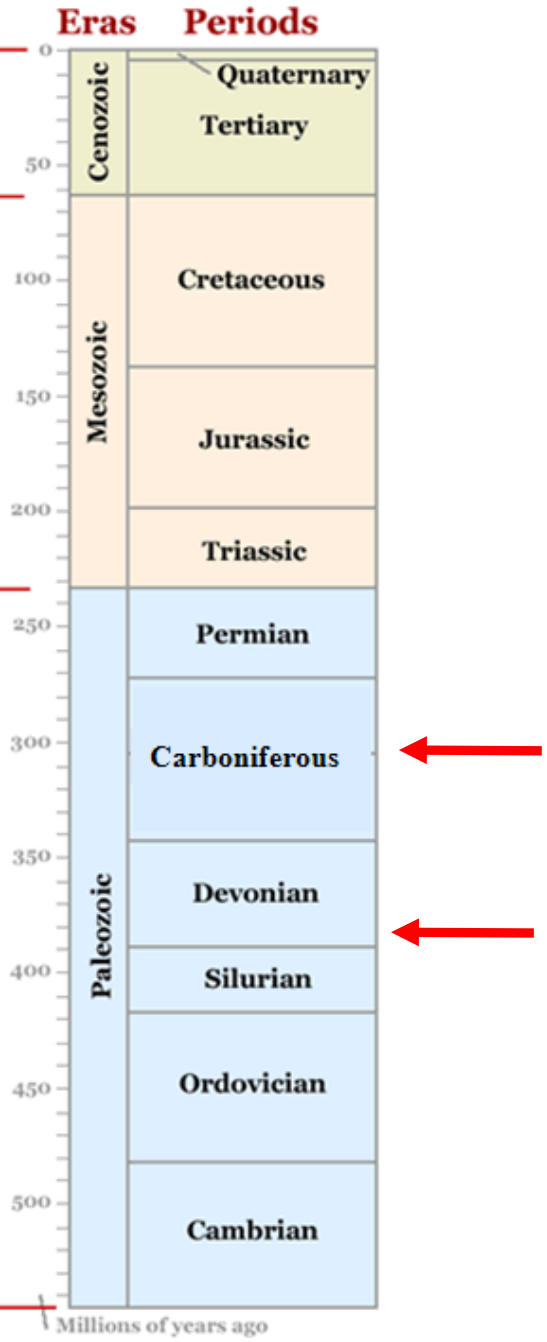
Fig. 37. Rekonstruktion einer Graptholithen-Qualle.



Early Devonian Plants

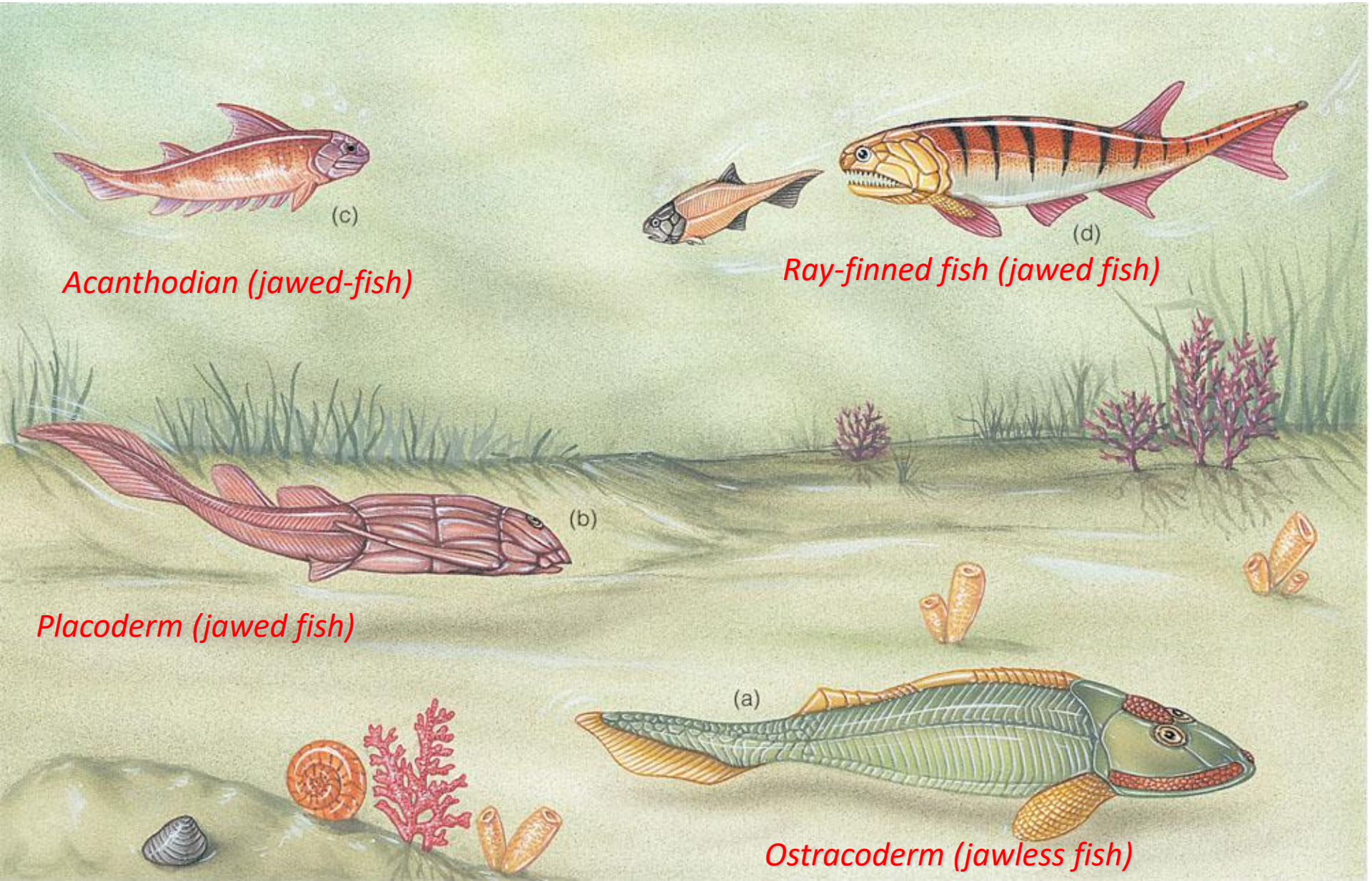



© 2001 Brooks/Cole Publishing/ITP



FENTOS FÓSILES

Evolución dos peixes



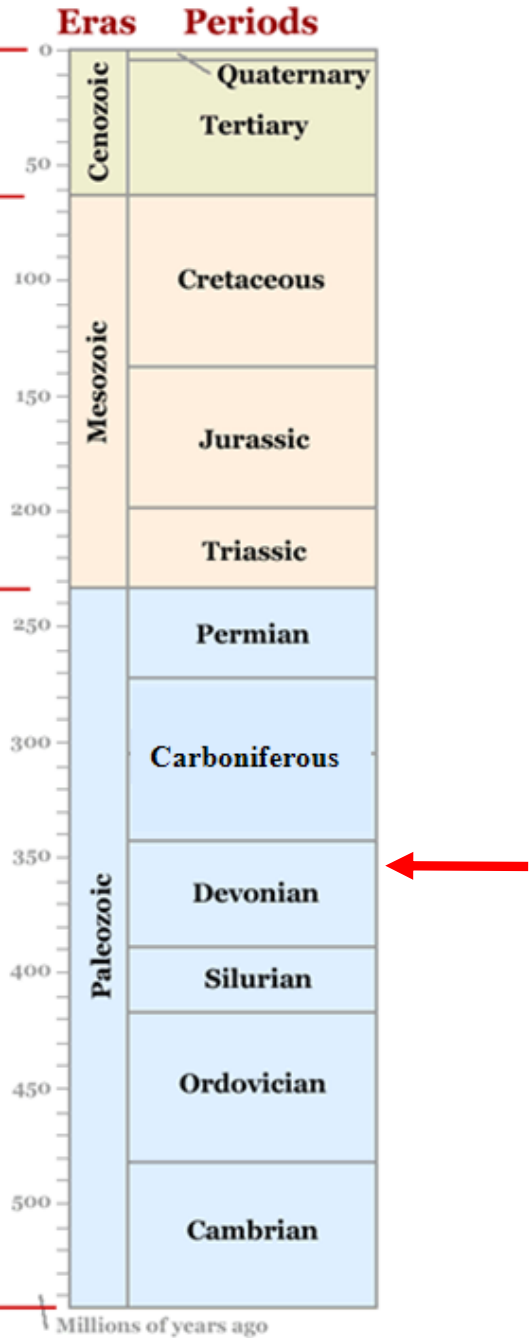
Acanthodian (jawed-fish)

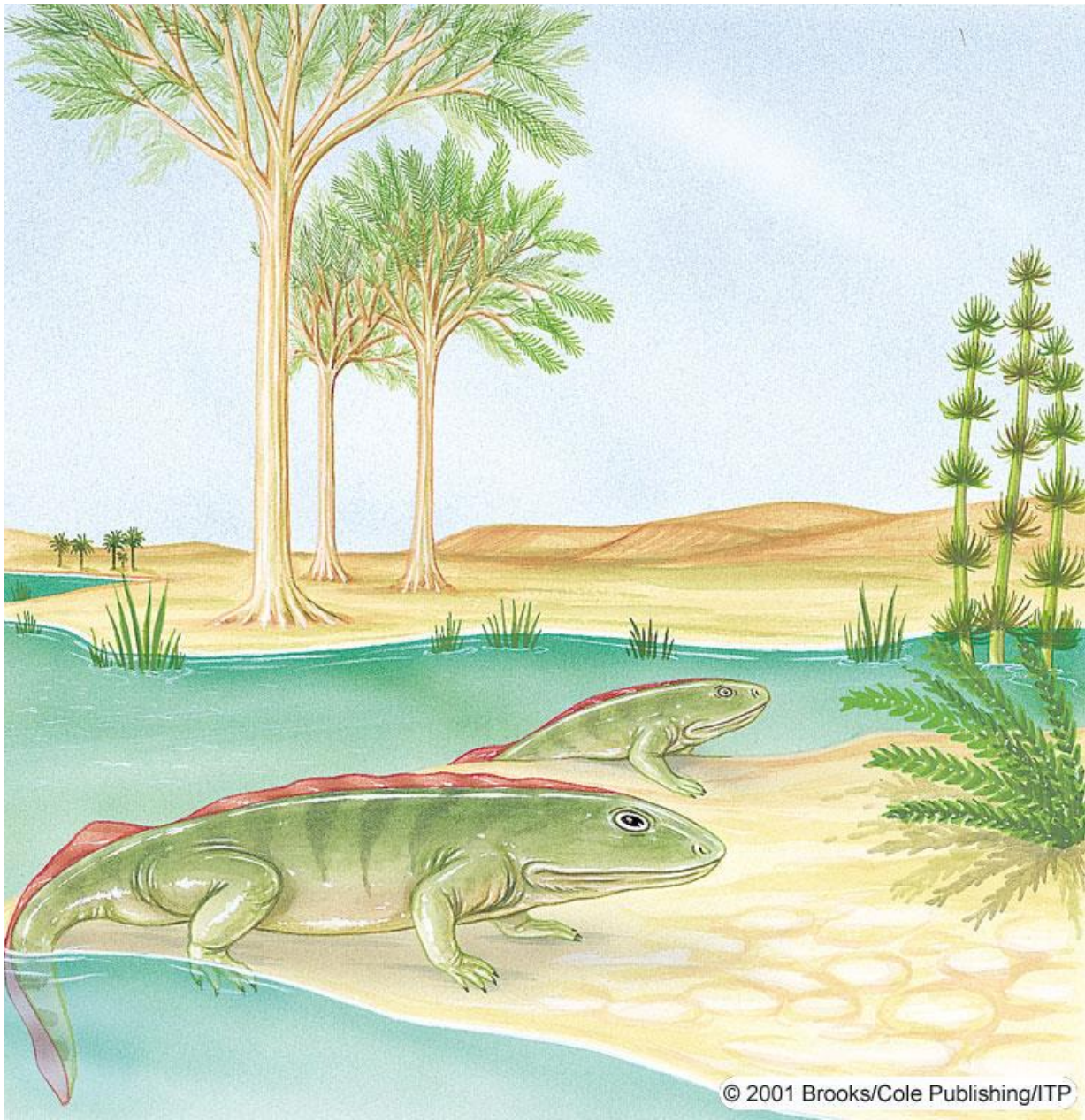
Ray-finned fish (jawed fish)

Placoderm (jawed fish)

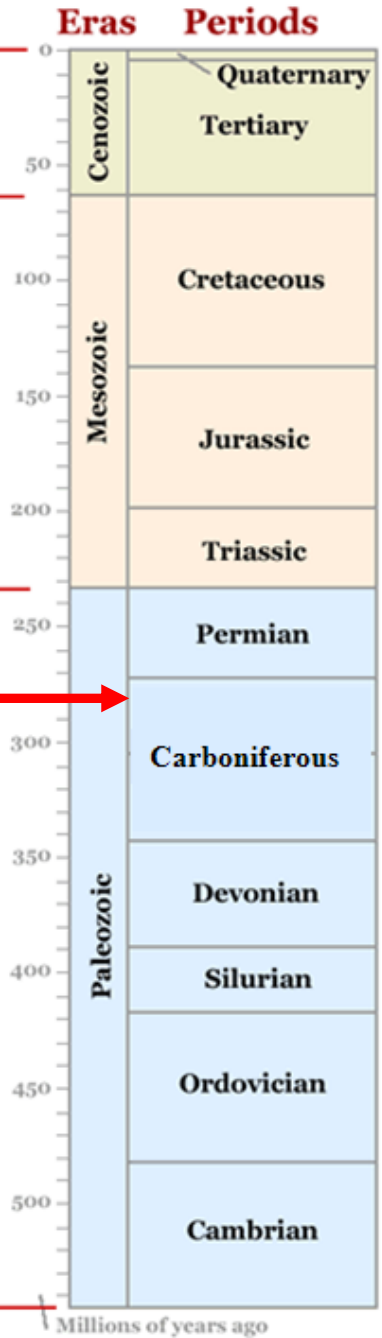
Ostracoderm (jawless fish)

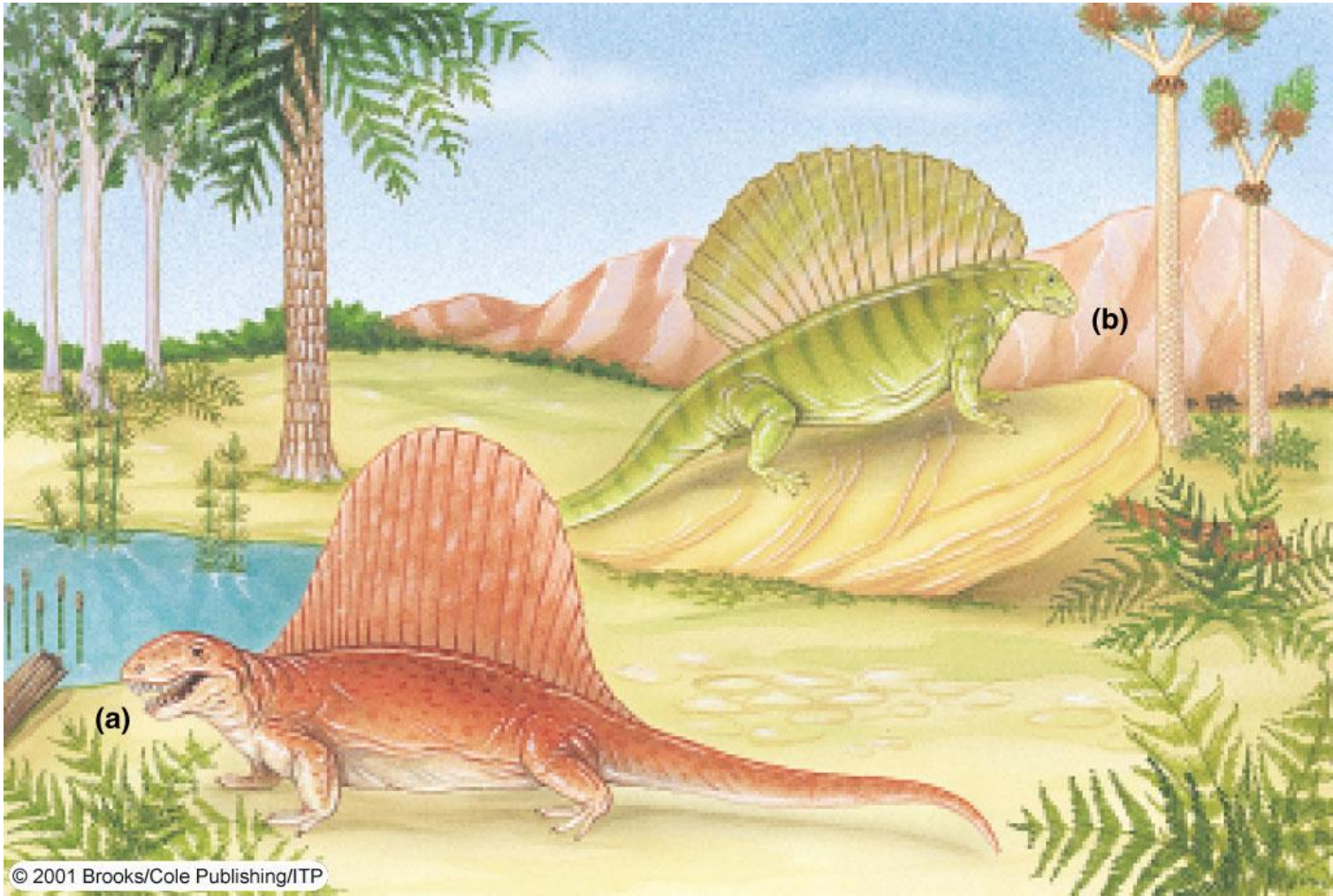
Primeiros anfibios



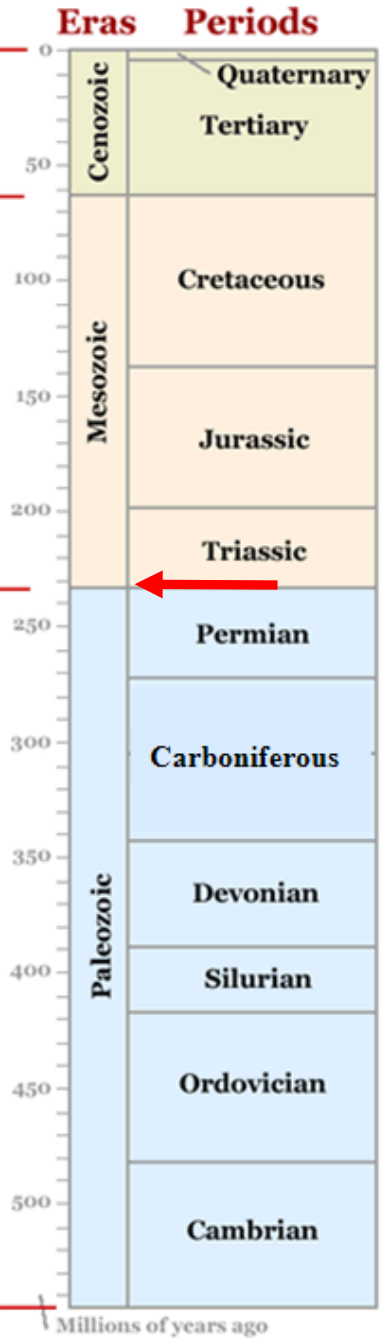


Aparición dos réptiles



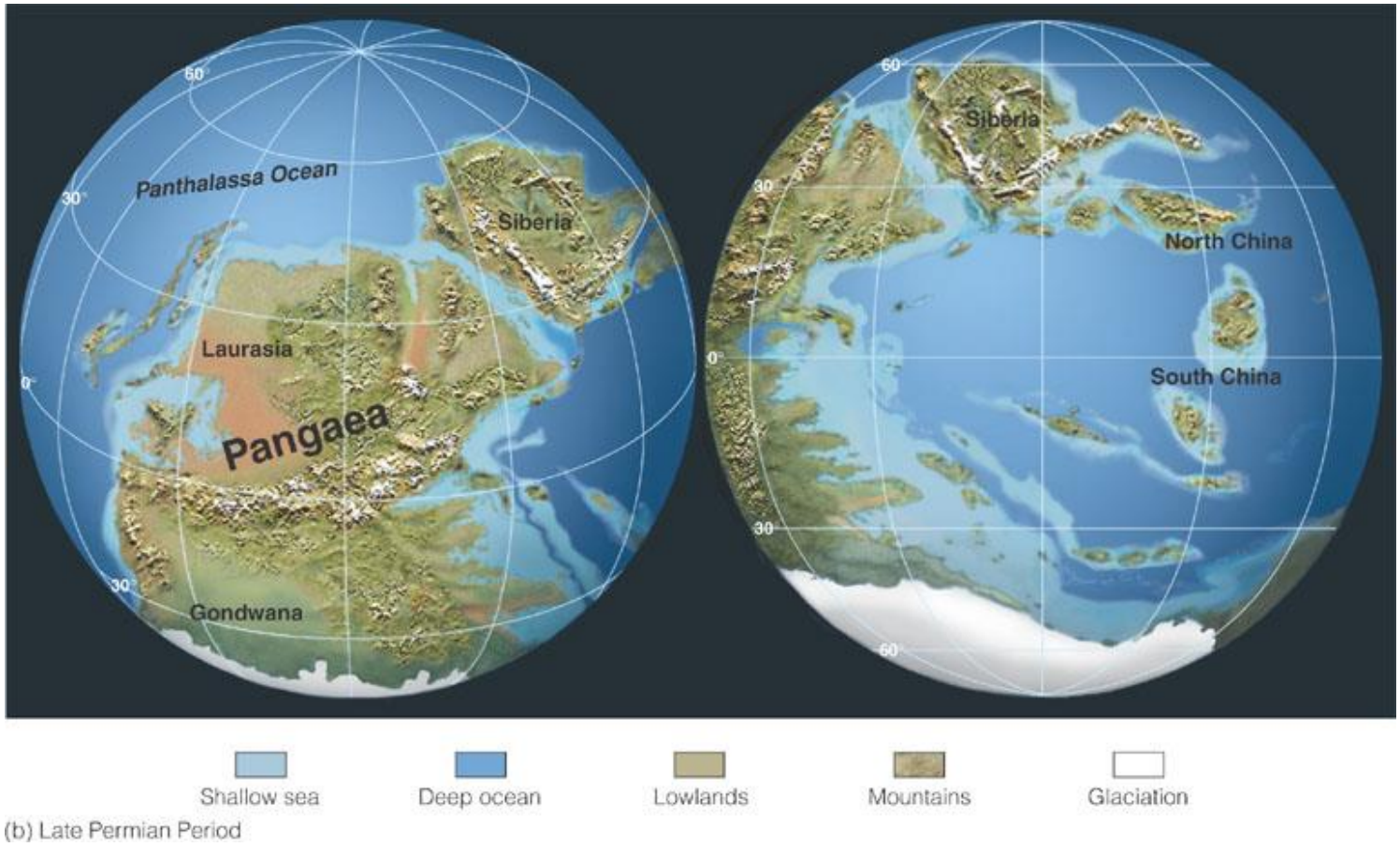


Terapsidos: réptiles antepasados dos mamíferos

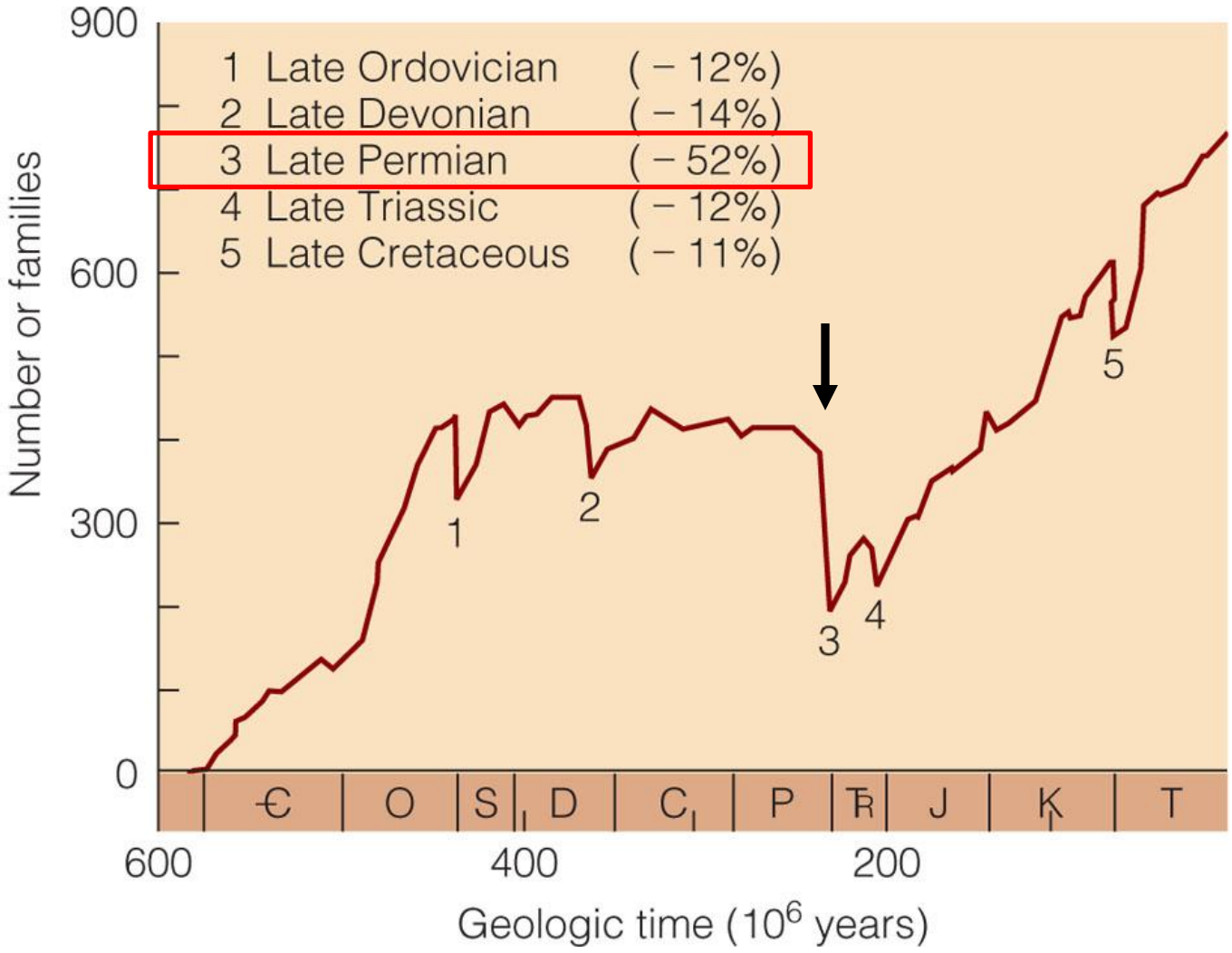


FINAL DO PÉRMICO

SE FORMA A PANXEA E ACONTECE A MAIOR EXTINCIÓN DA HISTORIA DA TERRA

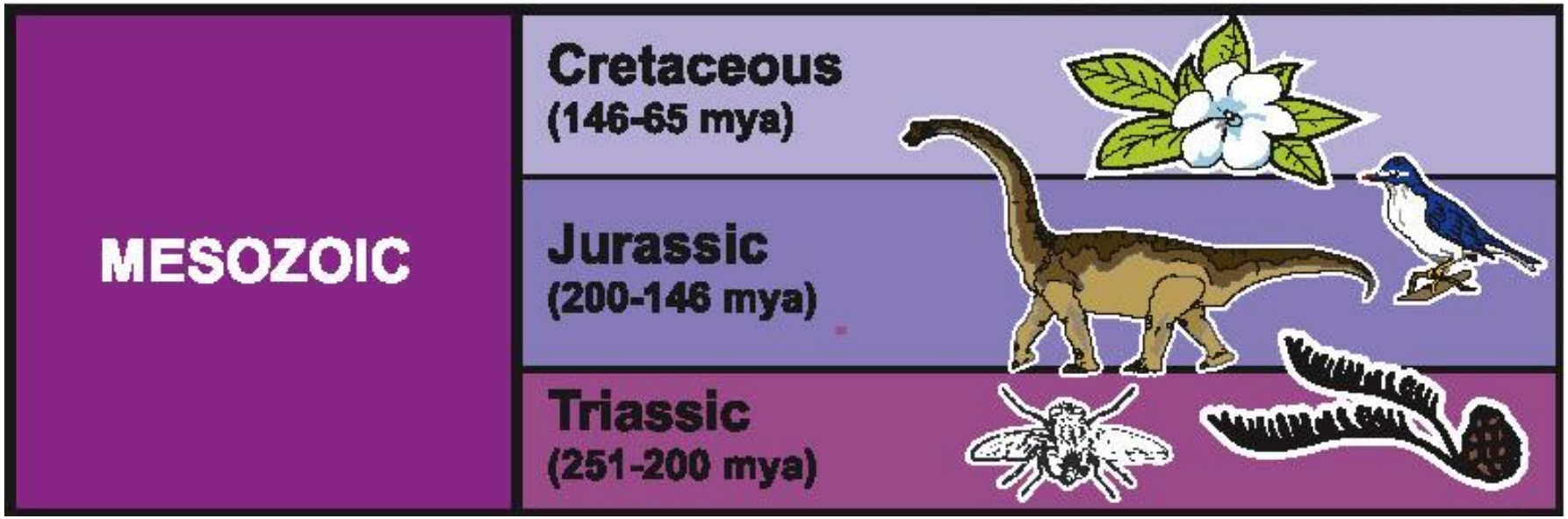


(b) Late Permian Period



Biodiversity through time for the Phanerozoic Eon; symbols at bottom are Periods

MESOZOICO


MESOZOIC
Cretaceous
(146-65 mya)
Jurassic
(200-146 mya)
Triassic
(251-200 mya)

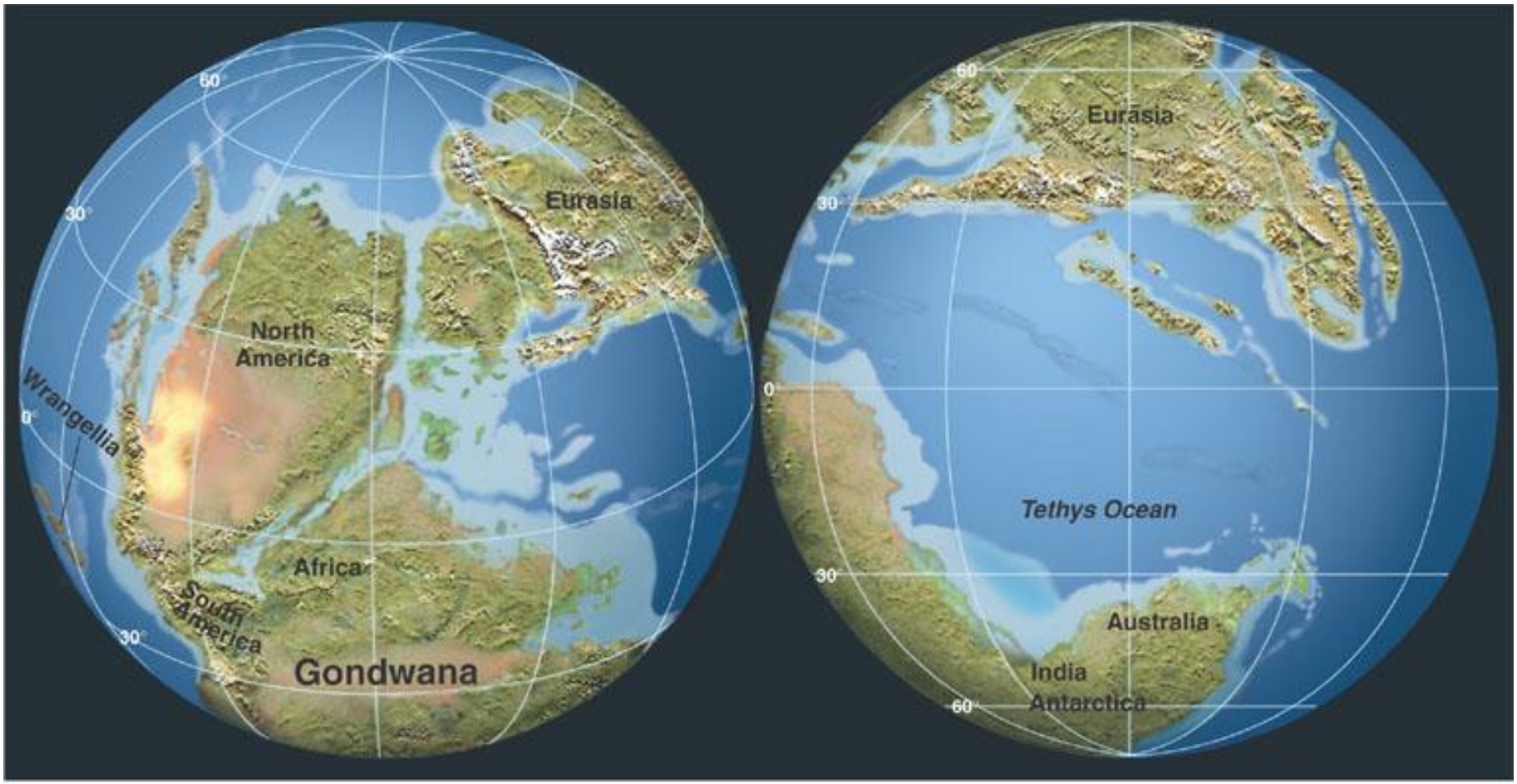
Fragmentación da panxea

- During the Triassic Period

(a) Triassic Period

Fragmentación da panxea

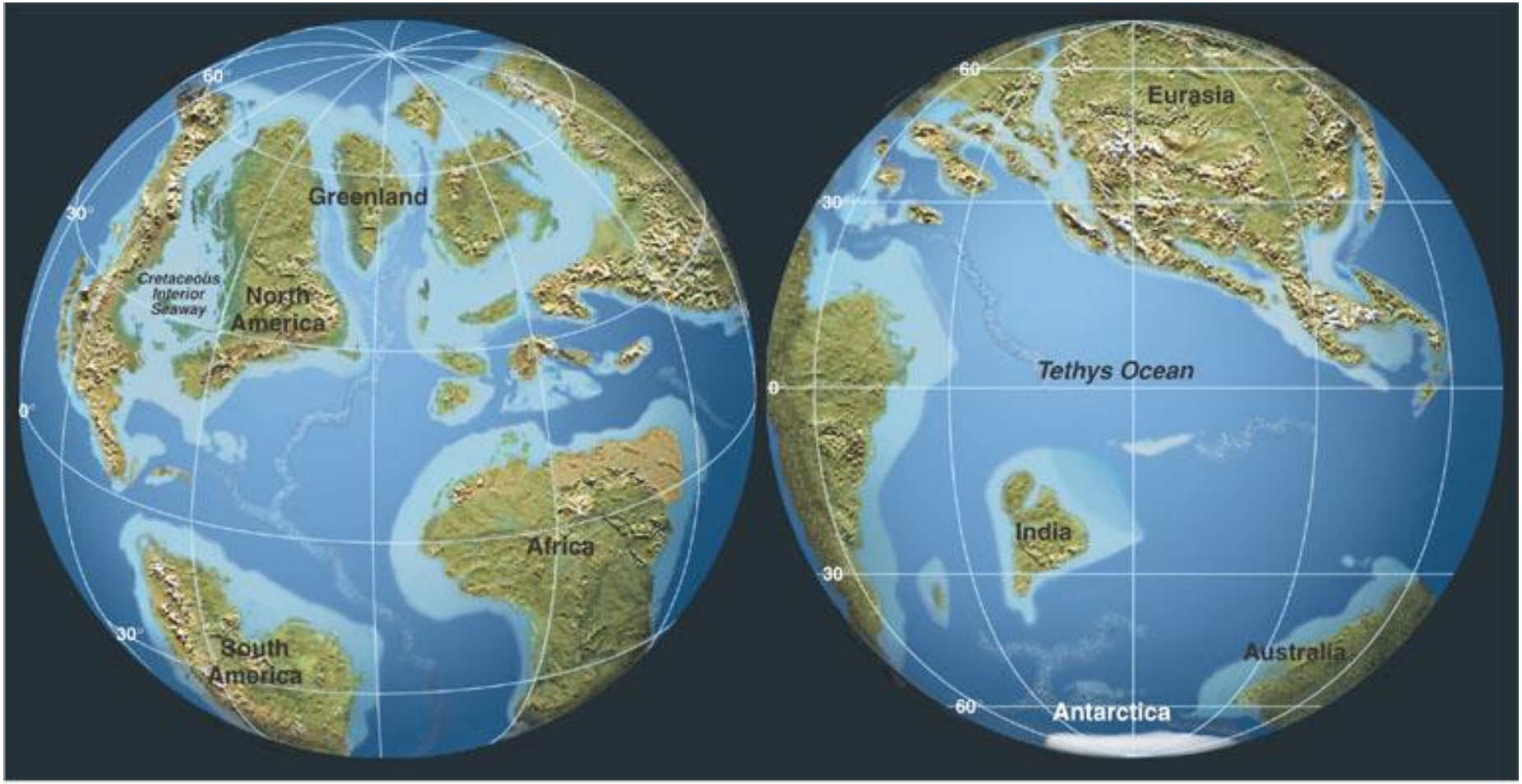
- During the Jurassic Period



(b) Jurassic Period

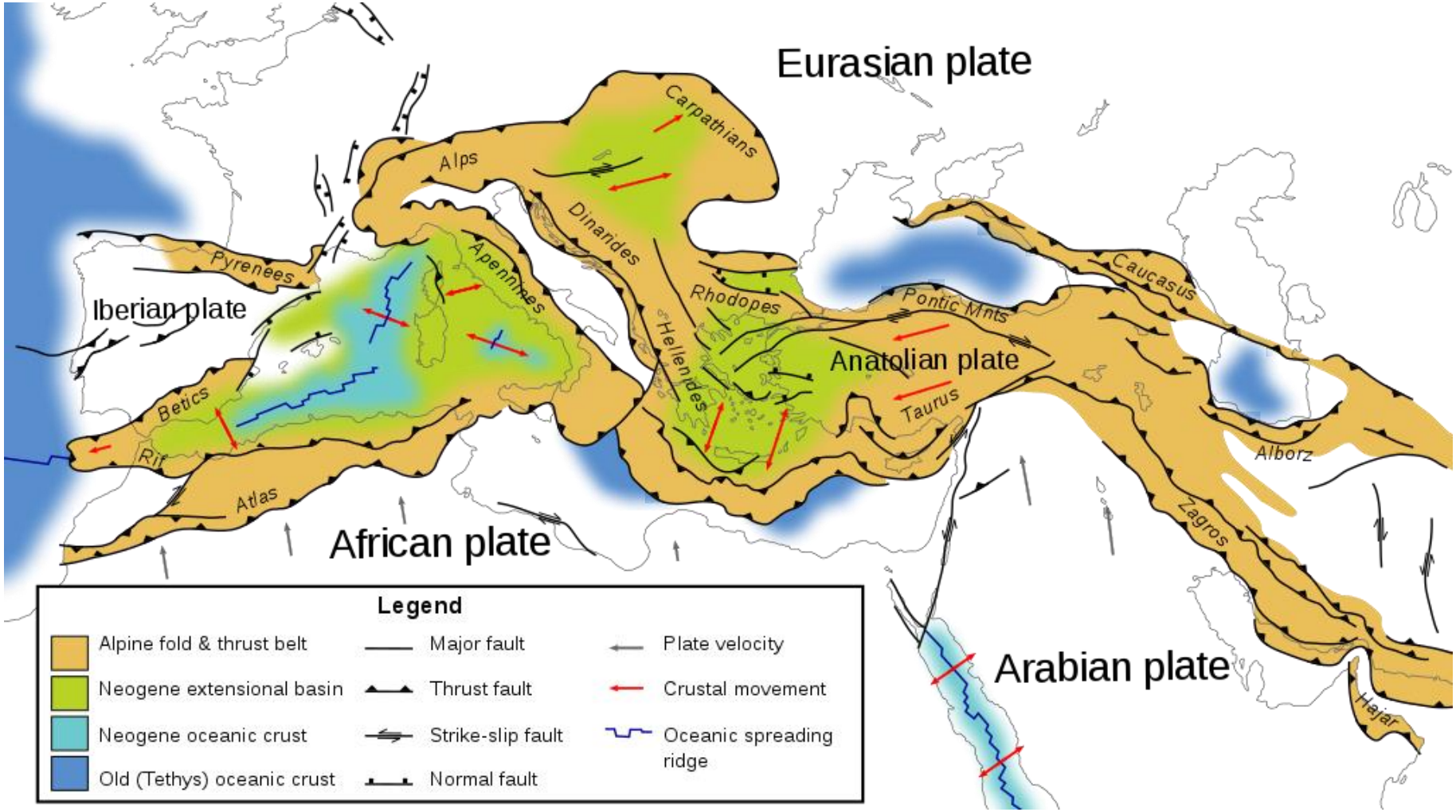
Fragmentación da panxea

- During the Late Cretaceous Period



(c) Late Cretaceous Period

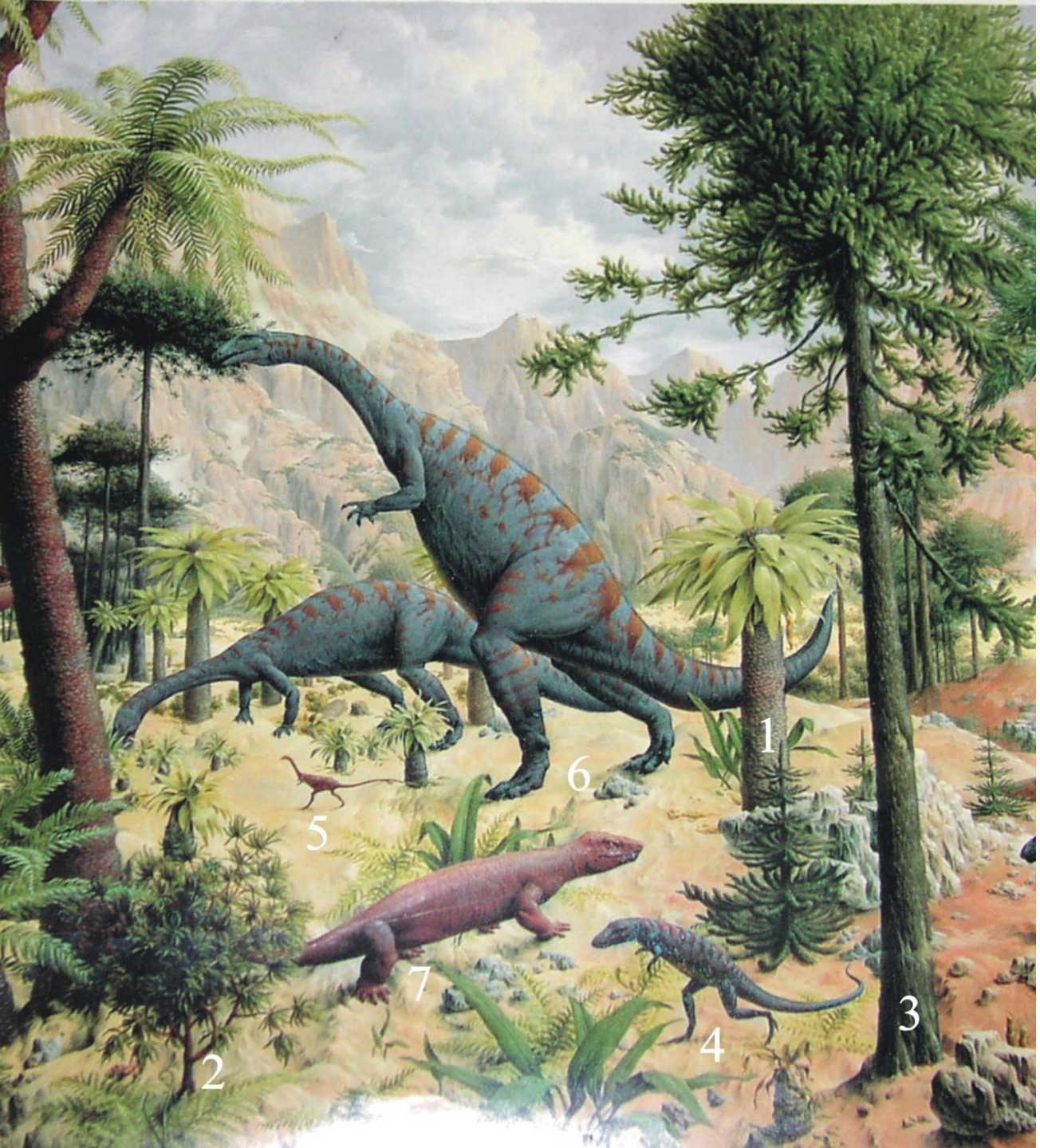
OROXENIA ALPINA



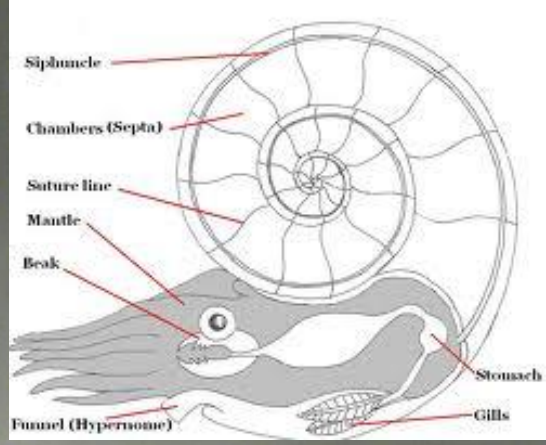
VIDA NO MESOZOICO

RÉPTILES

XIMNOSPERMAS



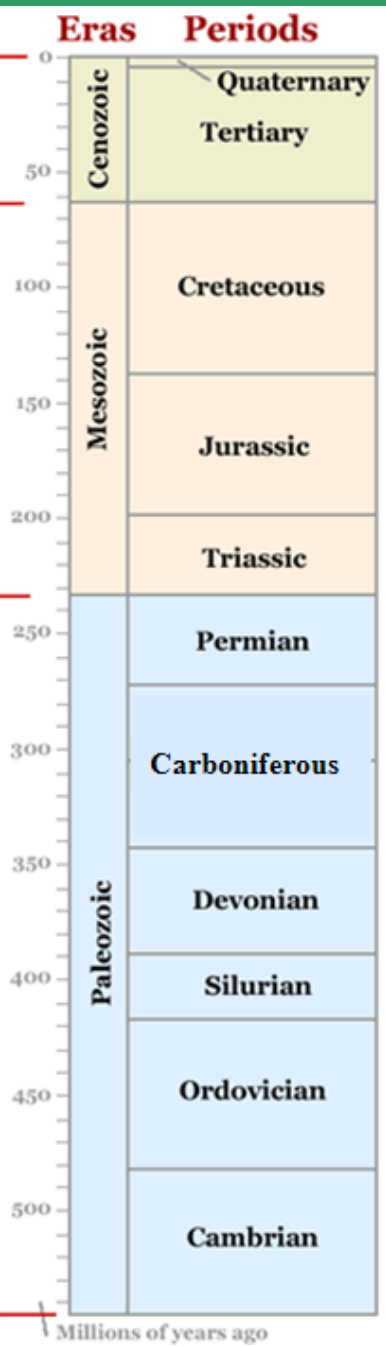

Stegosaurus
Allosaurus

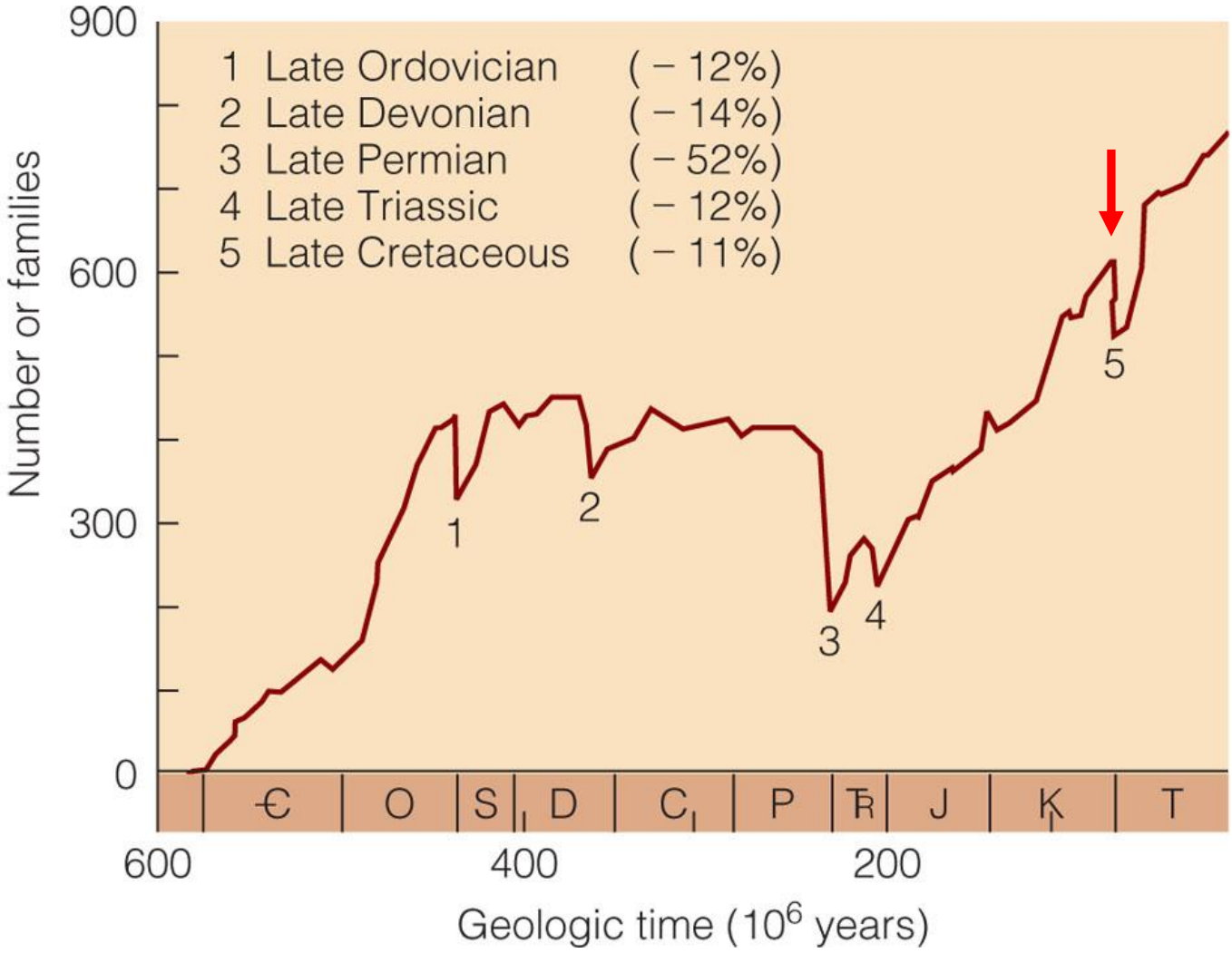

Siphuncle
Chambers (Septa)
Suture line
Mantle
Beak
Stomach
Funnel (Hyponome)
Gills

Ammonites

Era	Period / Epoch		Age
CAENOZOIC	Pleistocene		1.8
	Pliocene		5
	Miocene		25
	Oligocene		38
	Eocene		55
	Palaeocene		65
MESOZOIC	Cretaceous		144
	Jurassic		213
	Triassic		248
PALAEOZOIC	Permian		286
	Carboniferous	Pennsylvanian	
		Mississippian	354
	Devonian		412
	Silurian		435
	Ordovician		492
	Cambrian		570
	Precambrian		Millions of years

FINAL MESOZOICO OUTRA EXTINCIÓN MASIVA

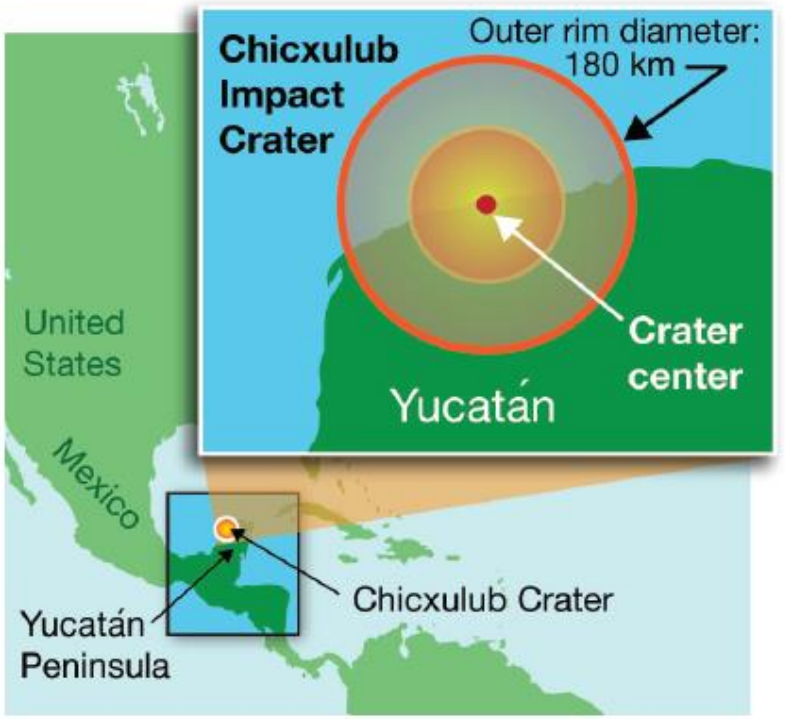




Biodiversity through time for the Phanerozoic Eon; symbols at bottom are Periods

Mass extinction

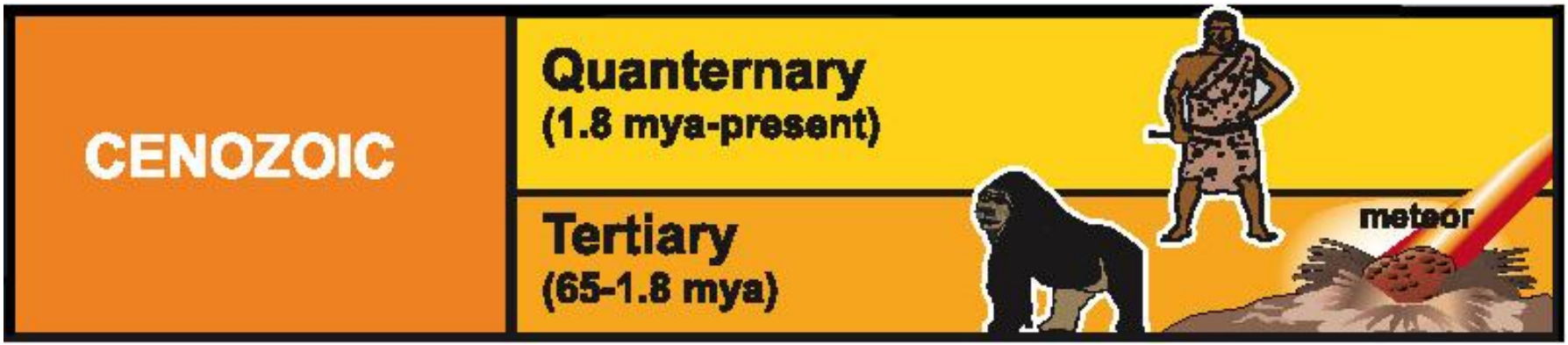
- Scientists have evidence that a large asteroid crashed near Mexico's Yucatan peninsula about 65 mya.
- The resulting climate change may have caused the extinction of Mesozoic Era reptiles, including most dinosaurs.



OUTRAS CAUSAS ?

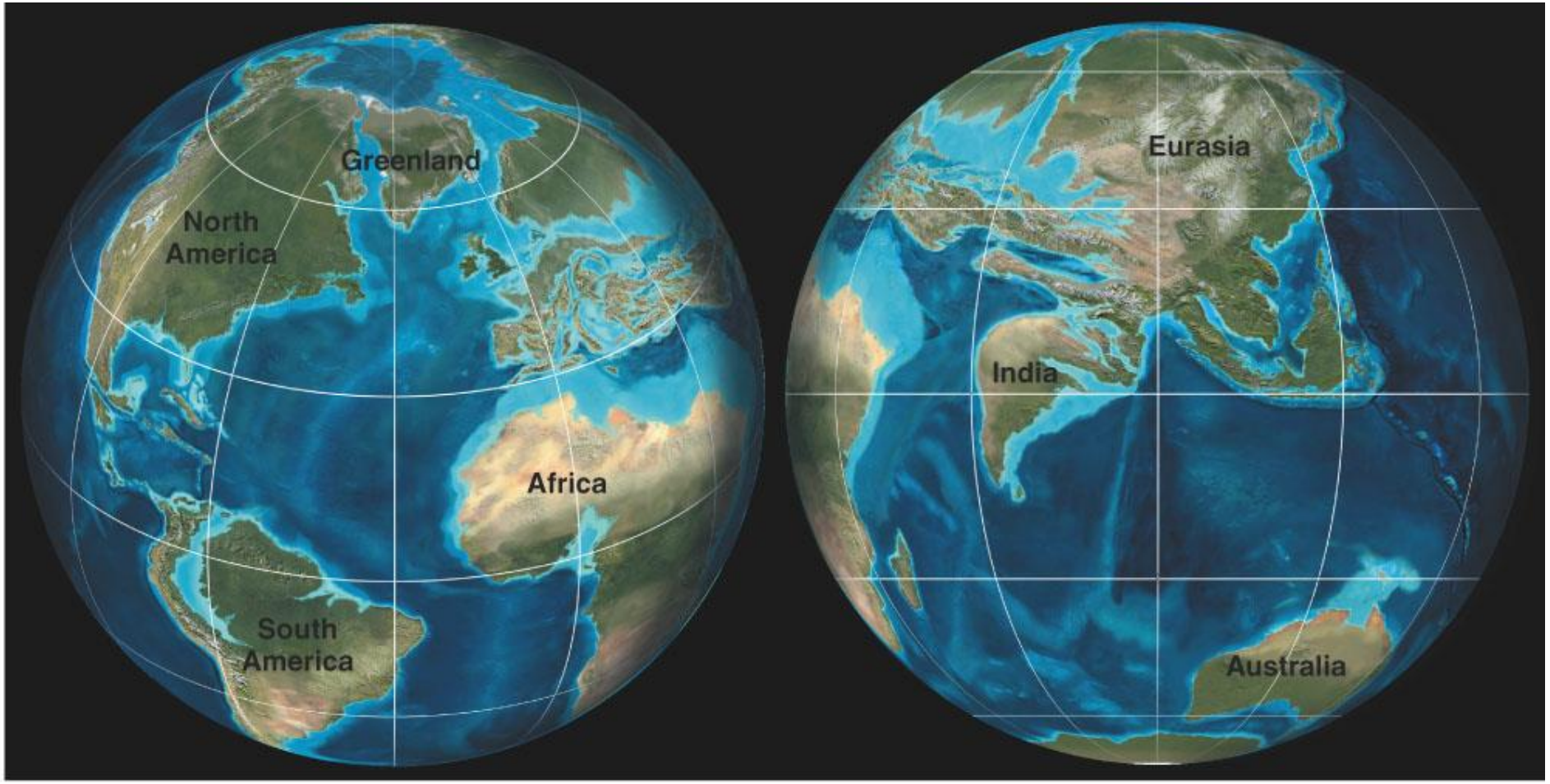
CENOZOICO

- Mamíferos e aves
- Plantas con flores (anxiospermas)
- Evolución humana



Cenozoic Paleogeography of the World

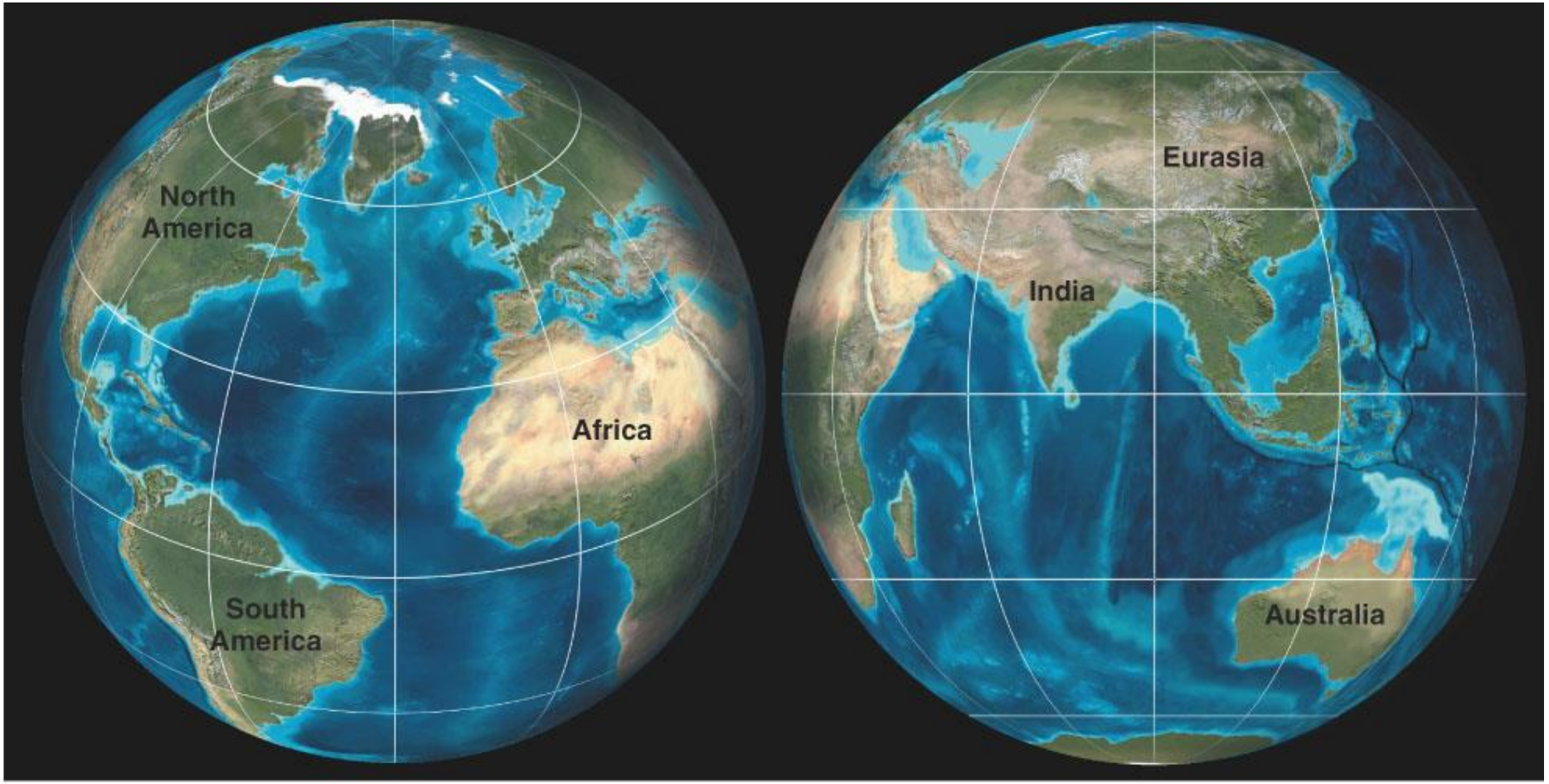
- Eocene Epoch



(a) The Eocene Epoch

Cenozoic Paleogeography of the World

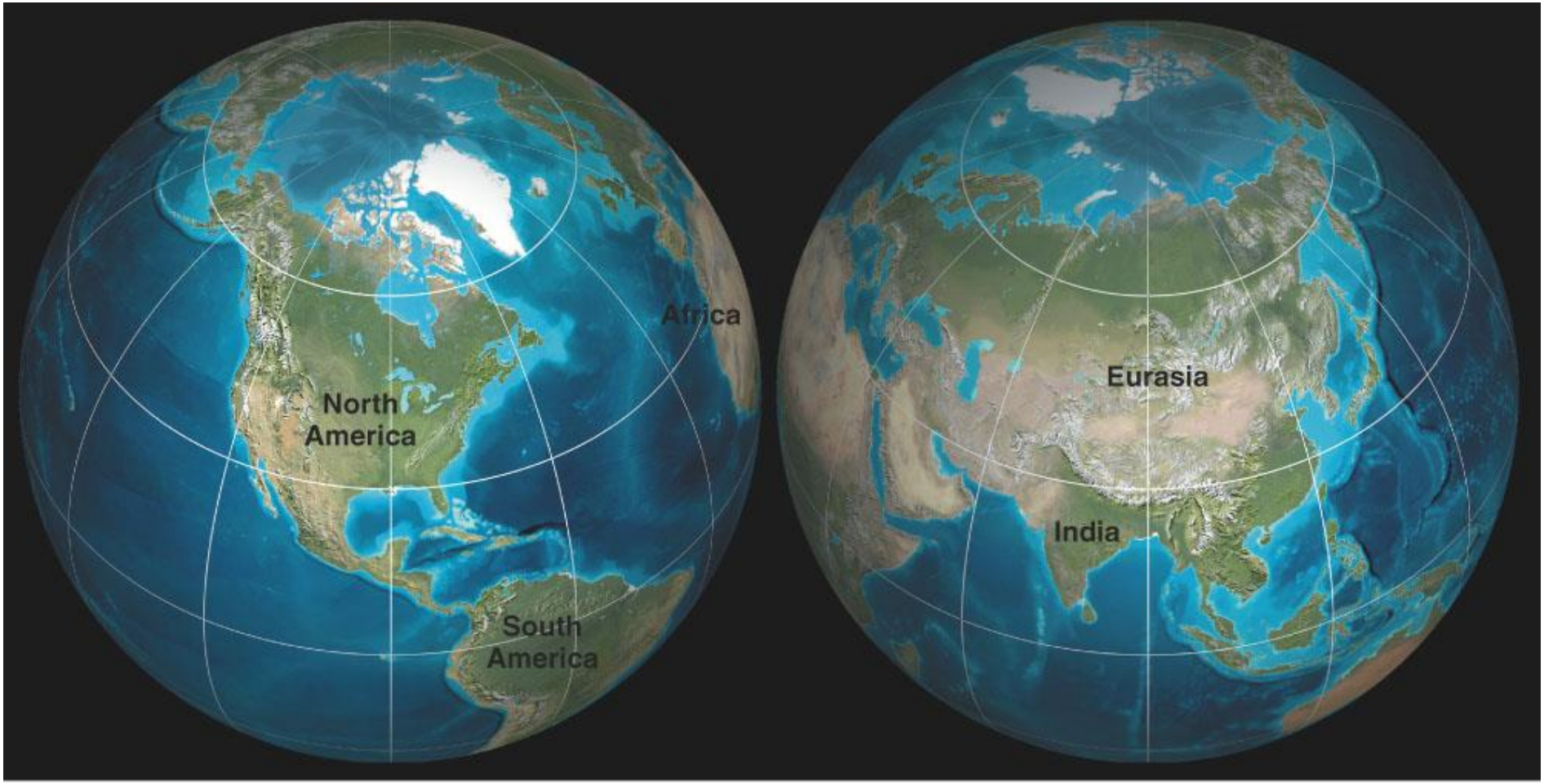
- Miocene Epoch



(b)The Miocene Epoch

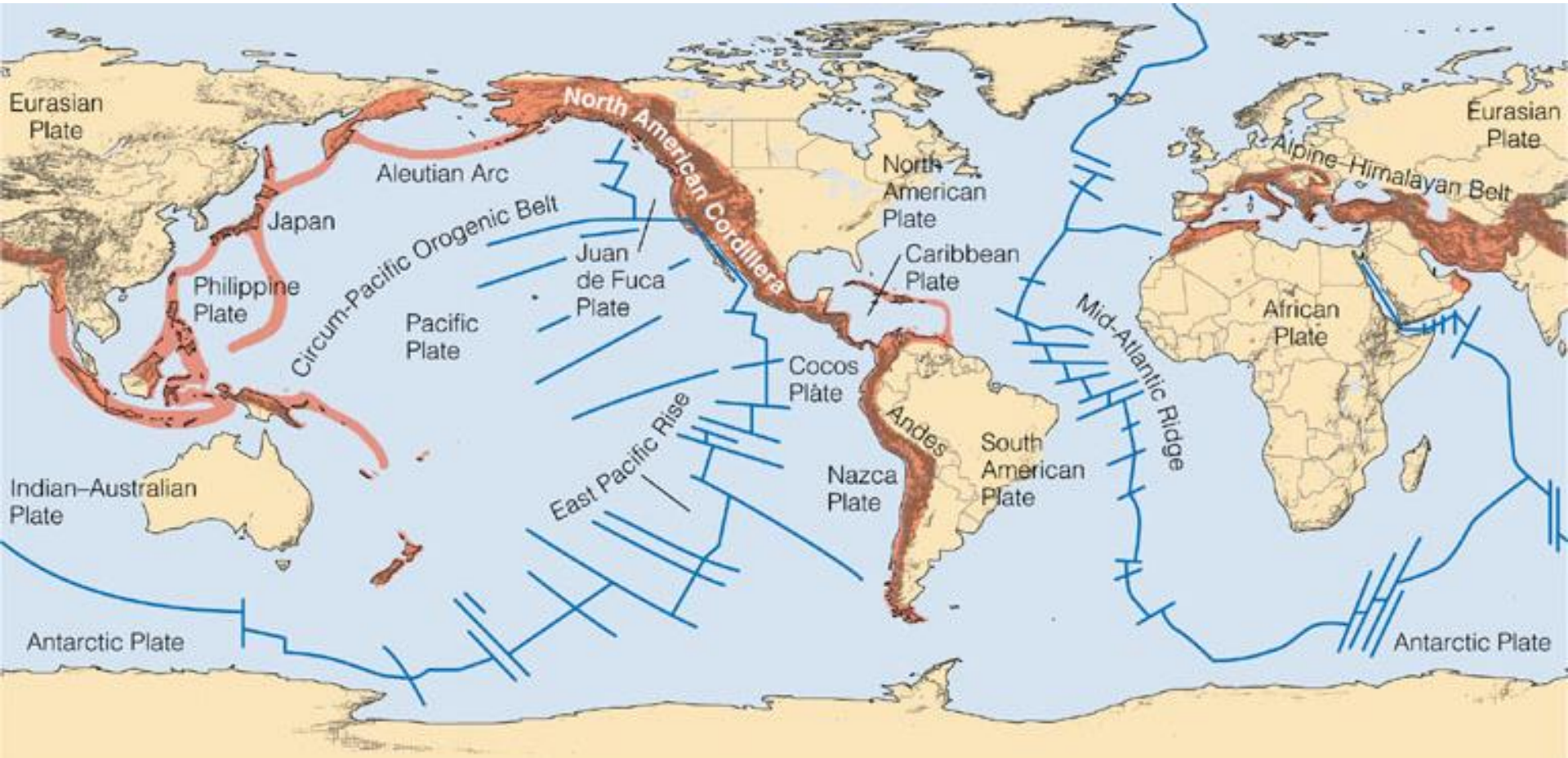
Cenozoic Paleogeography of the World

- Present Day

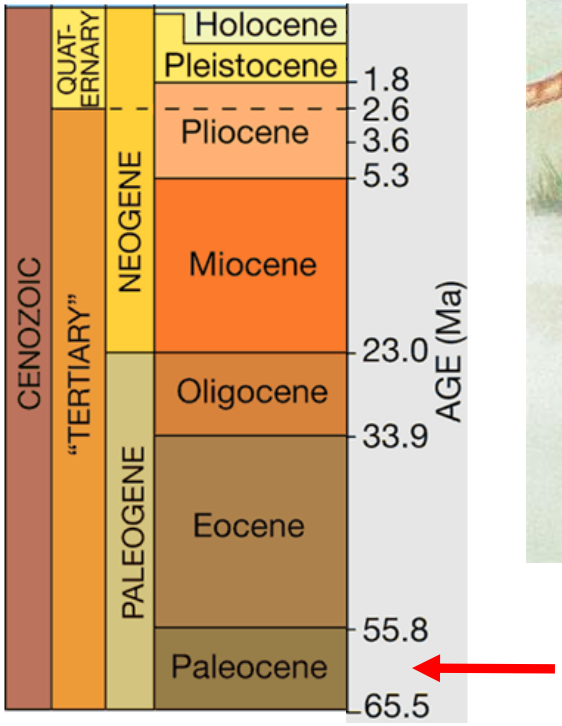


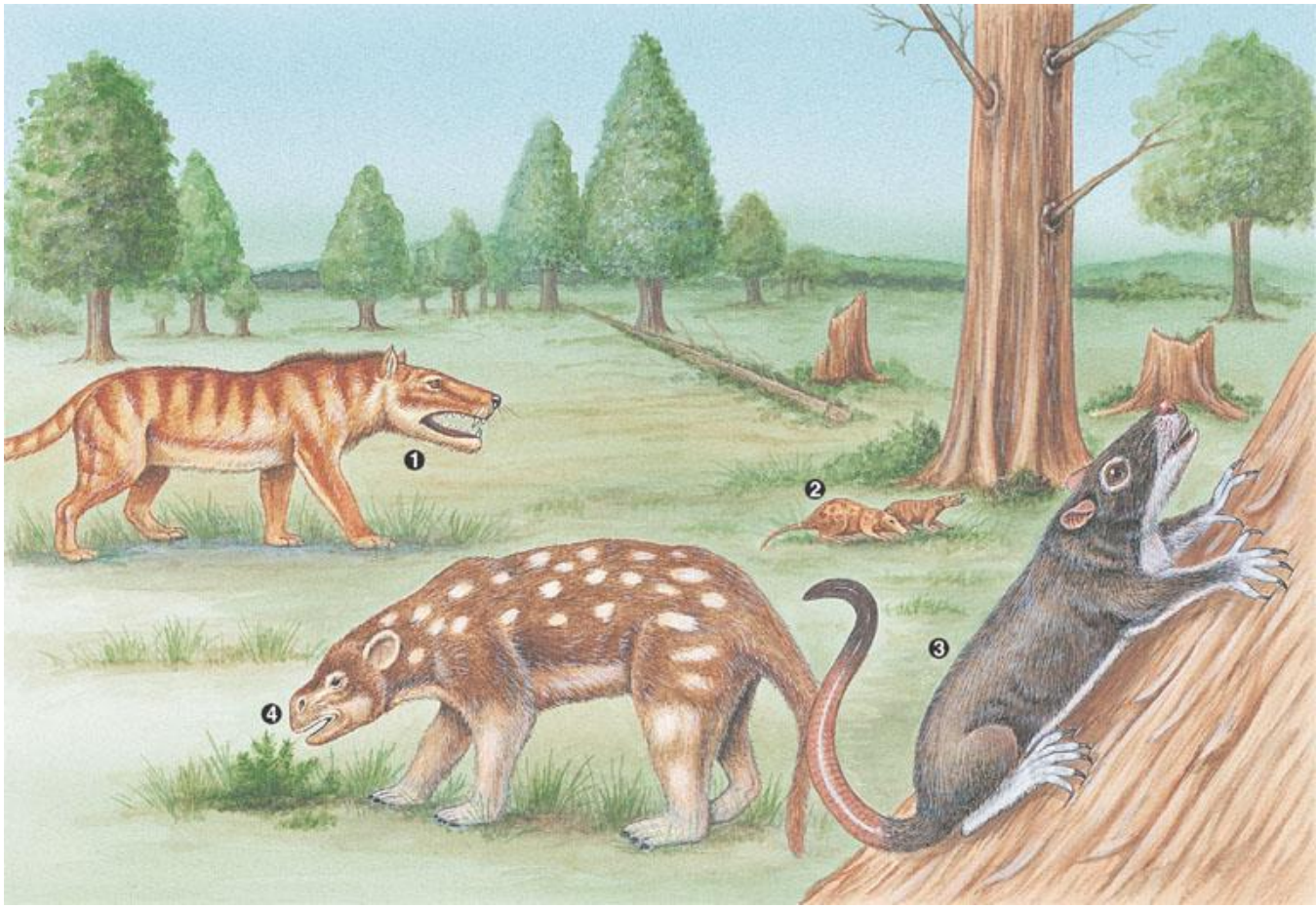
CONTINÚA A OROXENIA ALPINA

Circum-Pacific orogenic belt and the Alpine-Himalayan orogenic belt are the sites of most recent geologic and orogenic activity



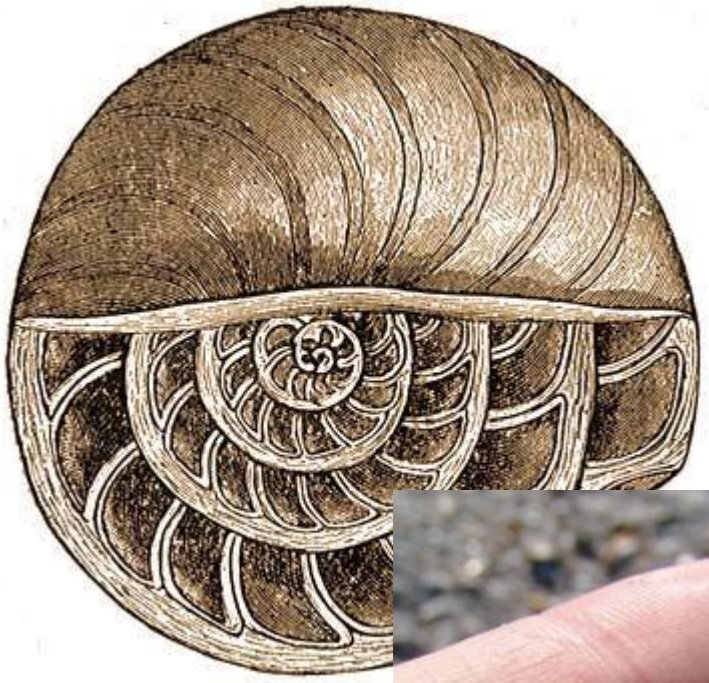
Archaic Mammals of the Paleocene





Dentes de tiburóns e quenllas

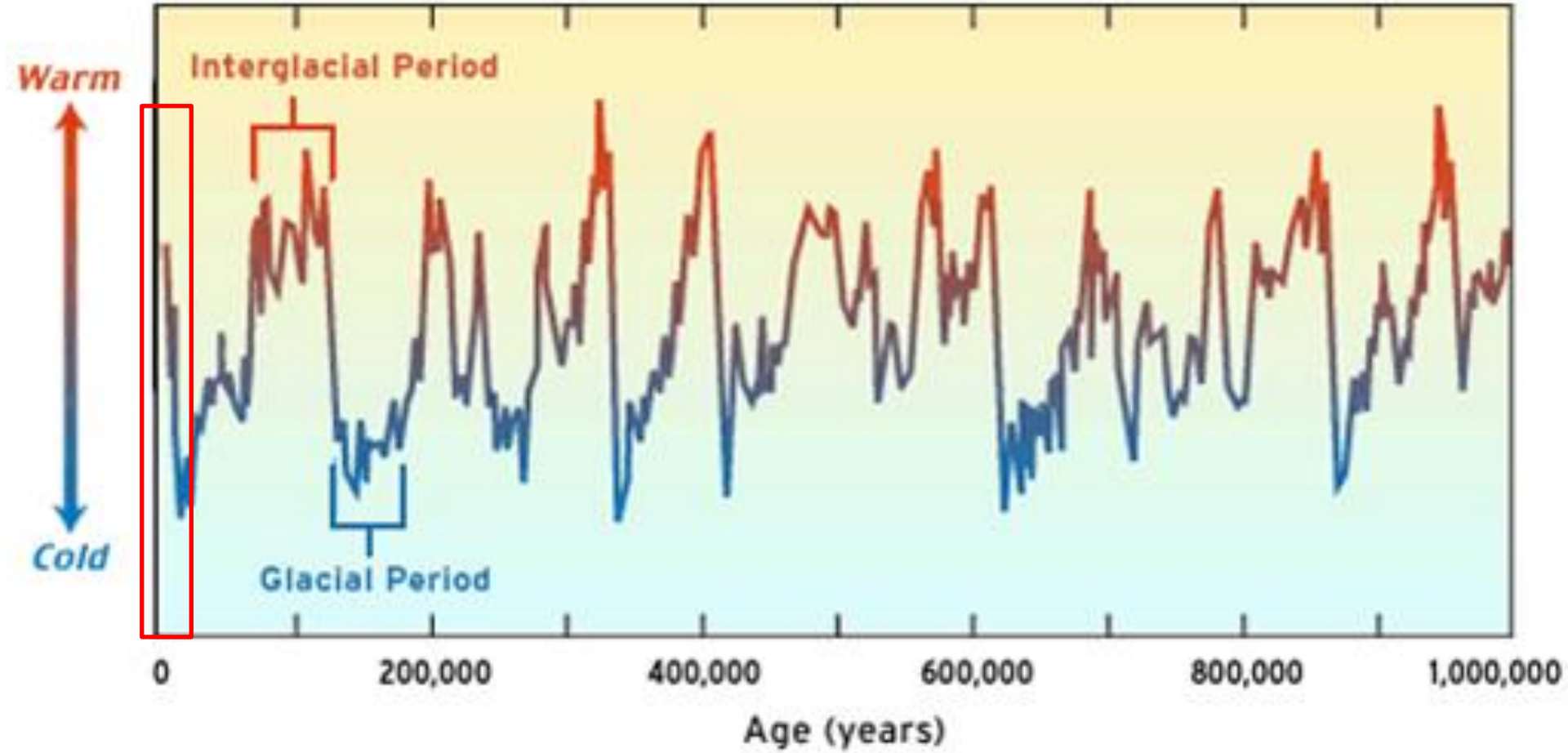
Nummulites

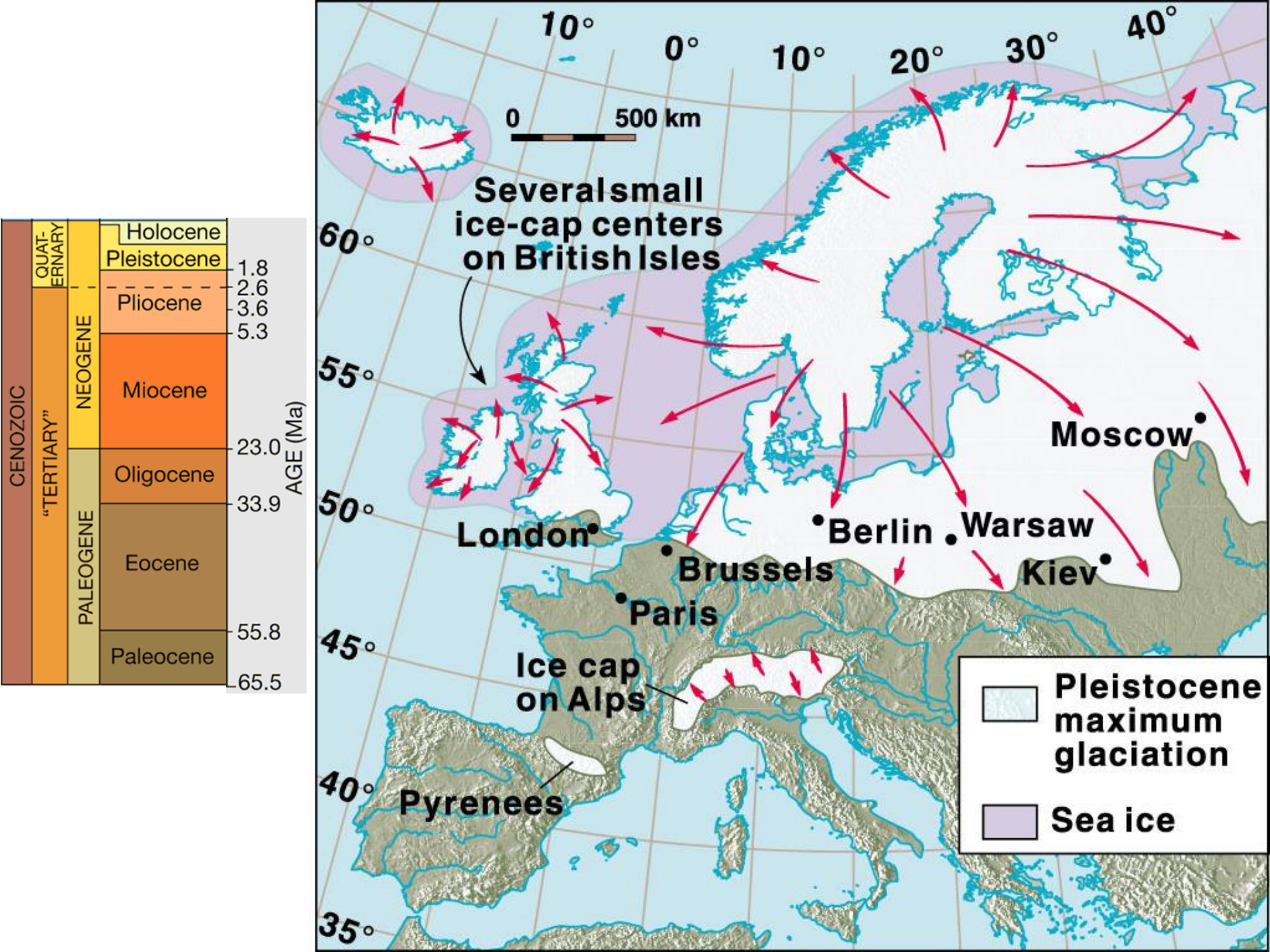


Glaciacións pleistocénicas

PERIODOS GLACIARES – INTERGLACIARES

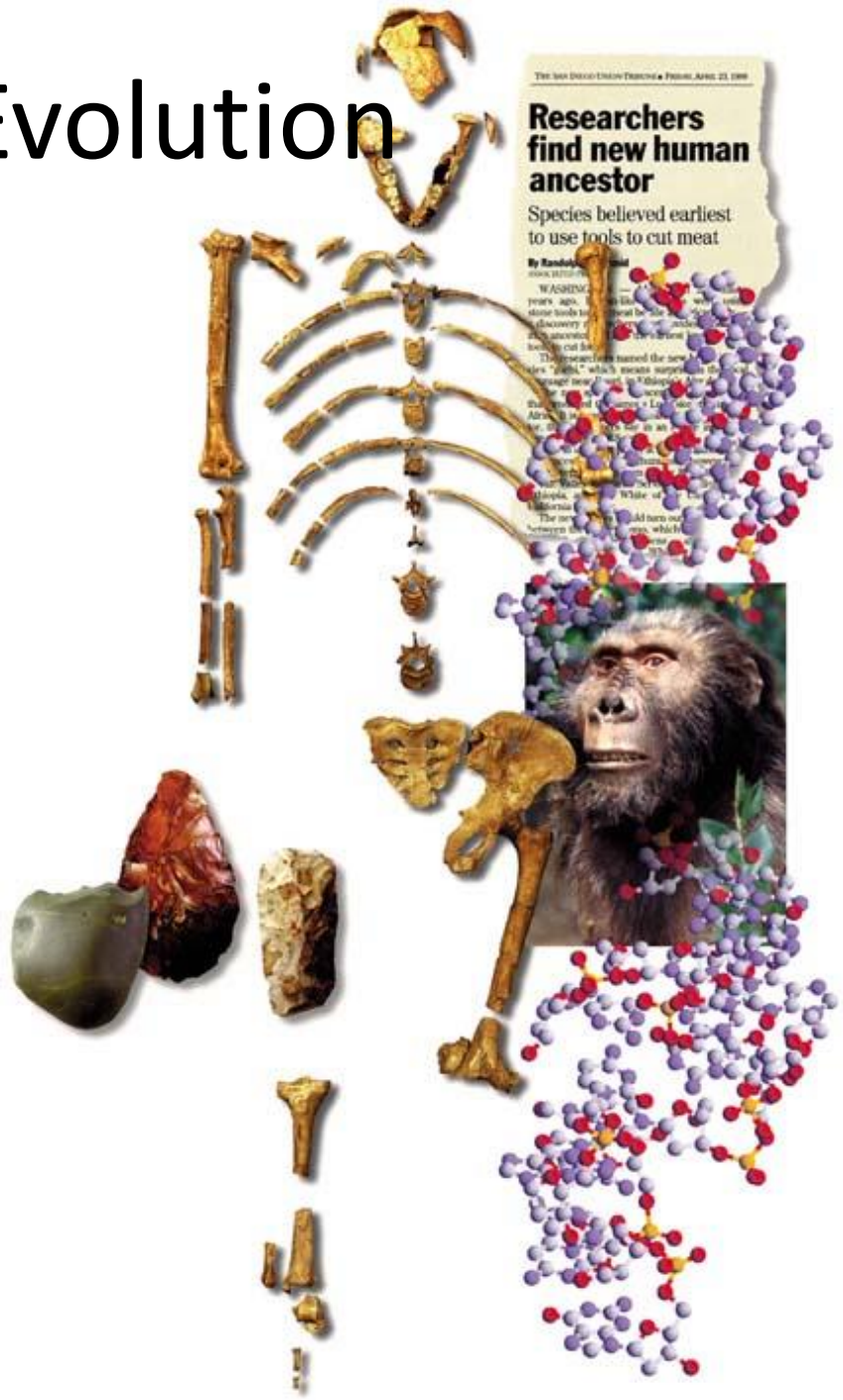
MÁXIMOS GLACIARIOS




CENOZOIC
"TERTIARY"
QUAT-ERNARY
NEOGENE
PALEOGENE
Holocene
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
1.8
2.6
3.6
5.3
23.0
33.9
55.8
65.5
AGE (Ma)
10°
0°
10°
20°
30°
40°
60°
55°
50°
45°
40°
35°
0
500 km
Several small ice-cap centers on British Isles
Moscow
London
Berlin
Warsaw
Brussels
Kiev
Paris
Ice cap on Alps
Pyrenees
Pleistocene maximum glaciation
Sea ice

Baby Mammoth

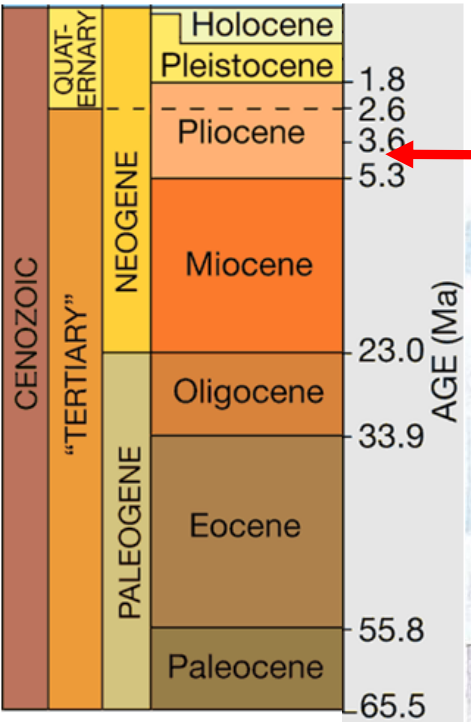
Human Evolution

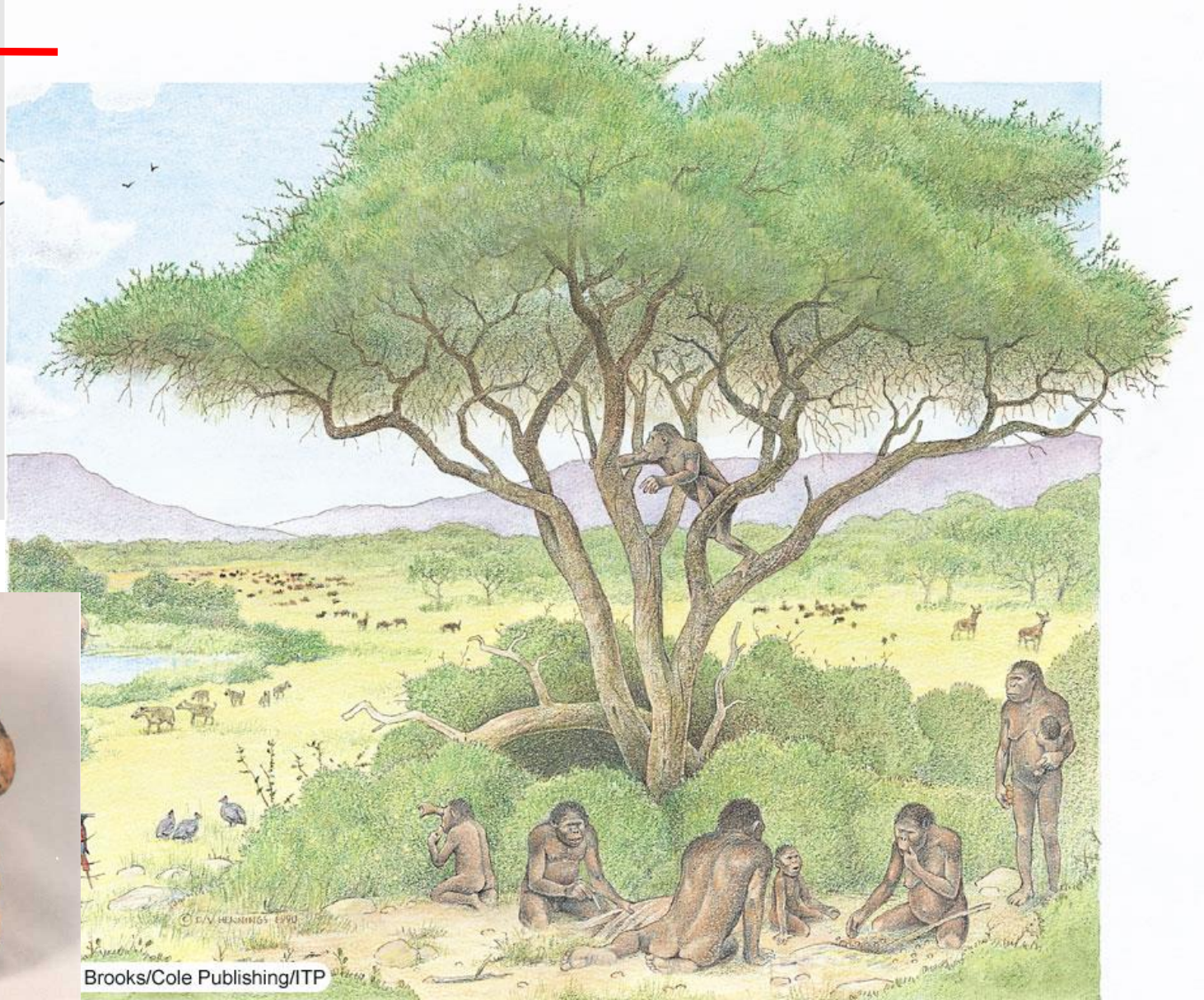


Researchers find new human ancestor

Species believed earliest to use tools to cut meat

Australopithecus afarensis (Lucy)





Homo sapiens
Hai uns 30.000 anos