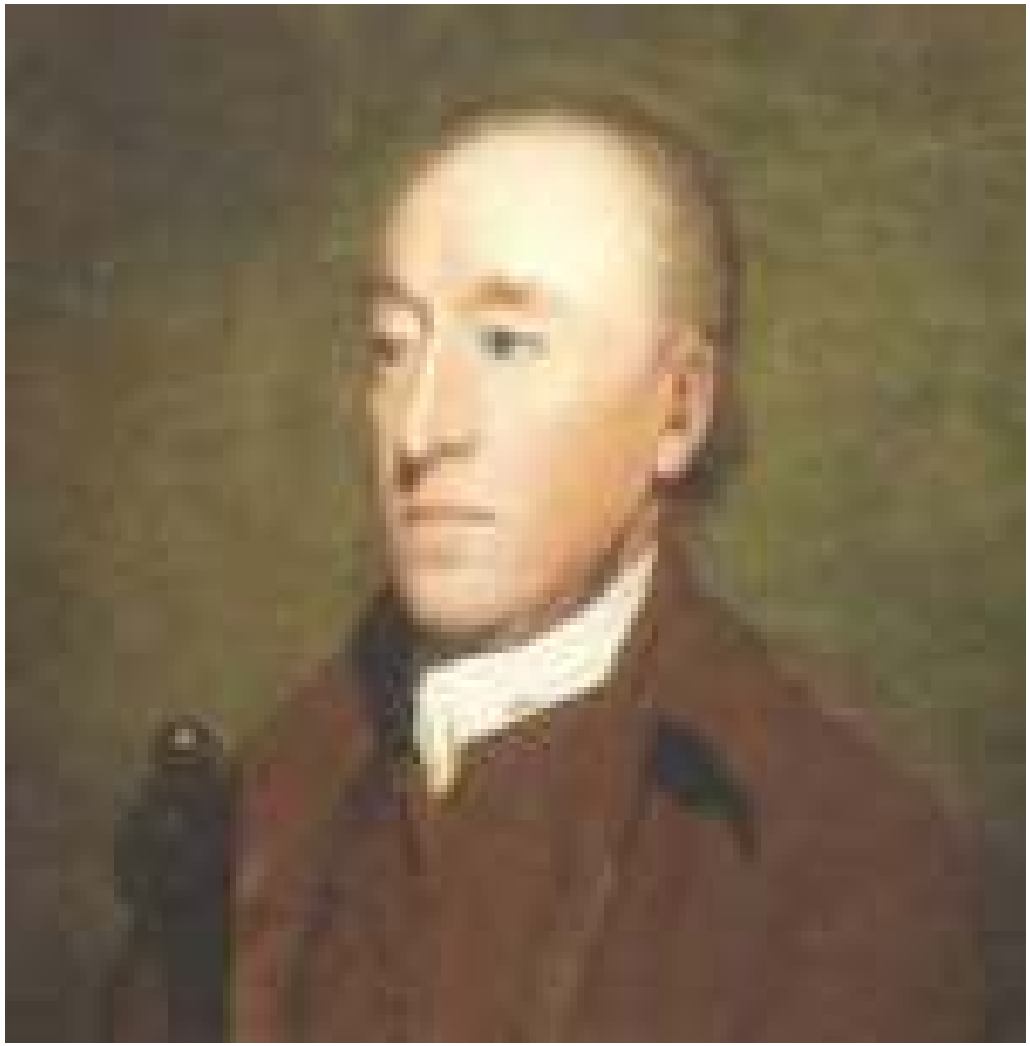
Pre AP Biology

Geologic Time and Processes (7.3)

Part 1

James Hutton

Theory of Gradualism



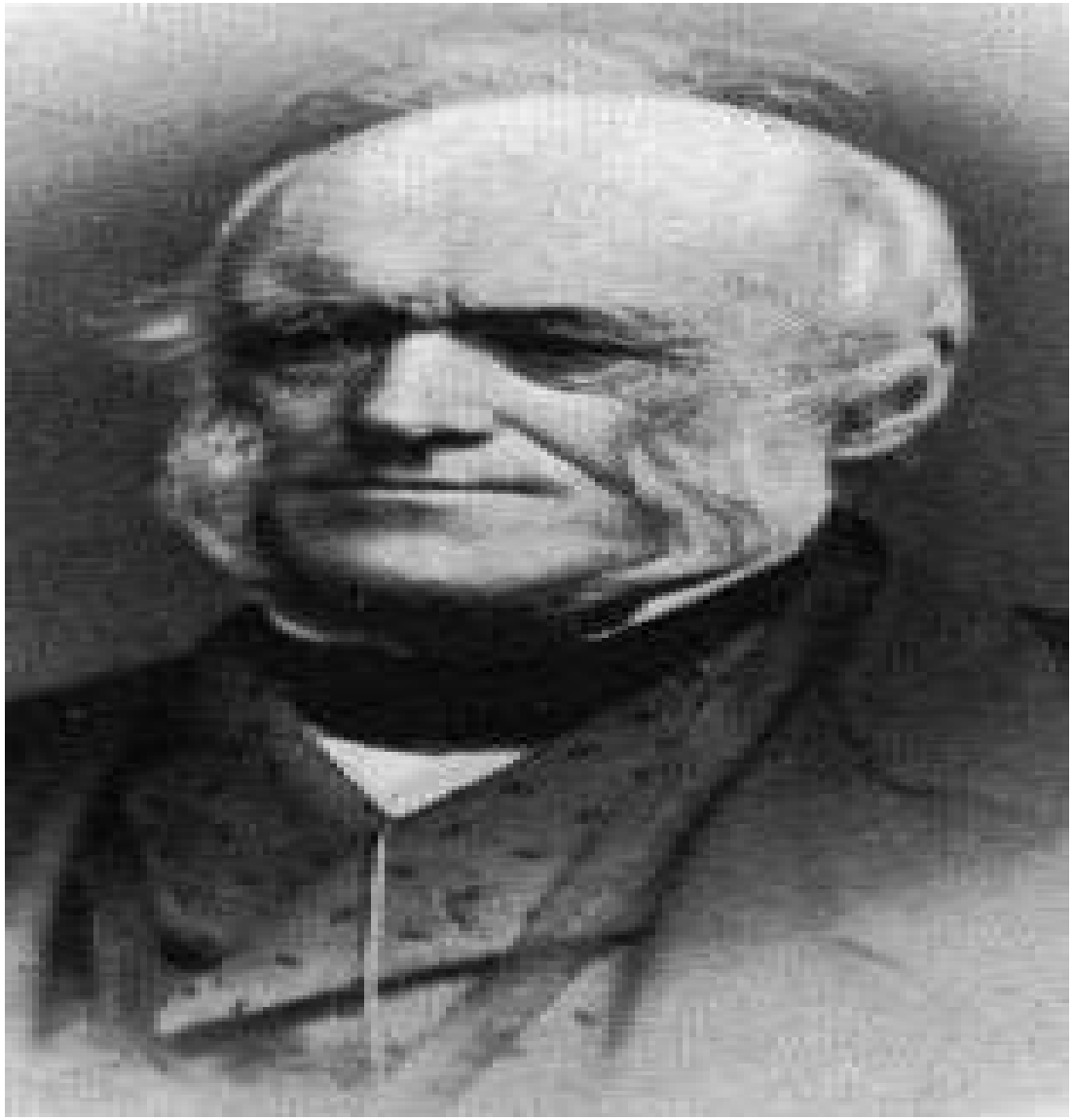
Young Mountains Appearence

Old Mountain Appearance

After Hundreds of Thousands year of weathering and erosion

Charles Lyell

Theory of Uniformitarianism



New Erosion on a roadside

Erosion over Millions of Years in the Grand Canyon of Arizona

Thunderstorms with Rain now

Thunderstorms Billions of Years Ago

Examples of fossils

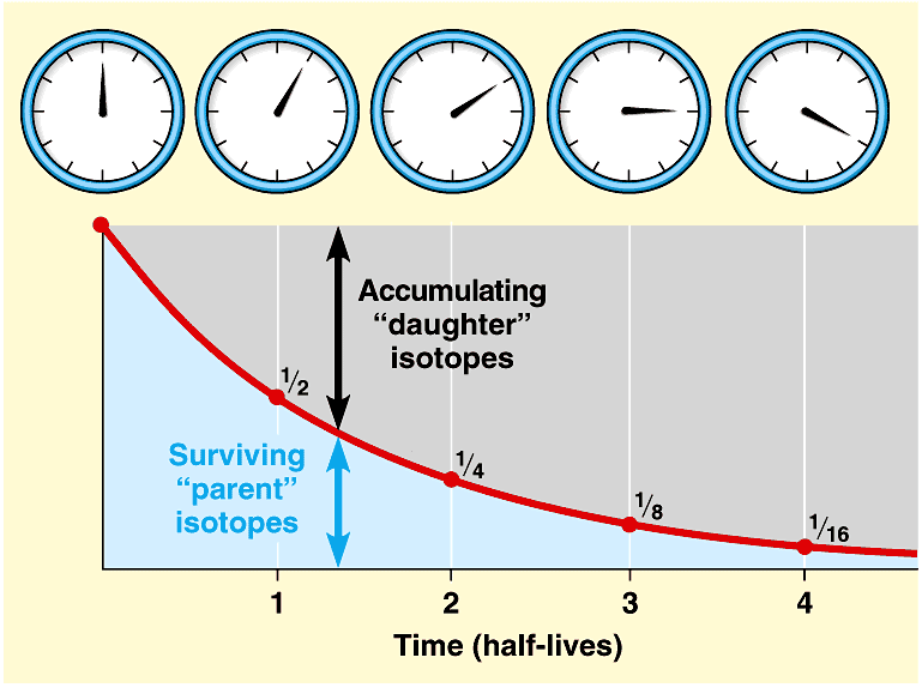
Examples of fossils

Absolute “radiometric” dating

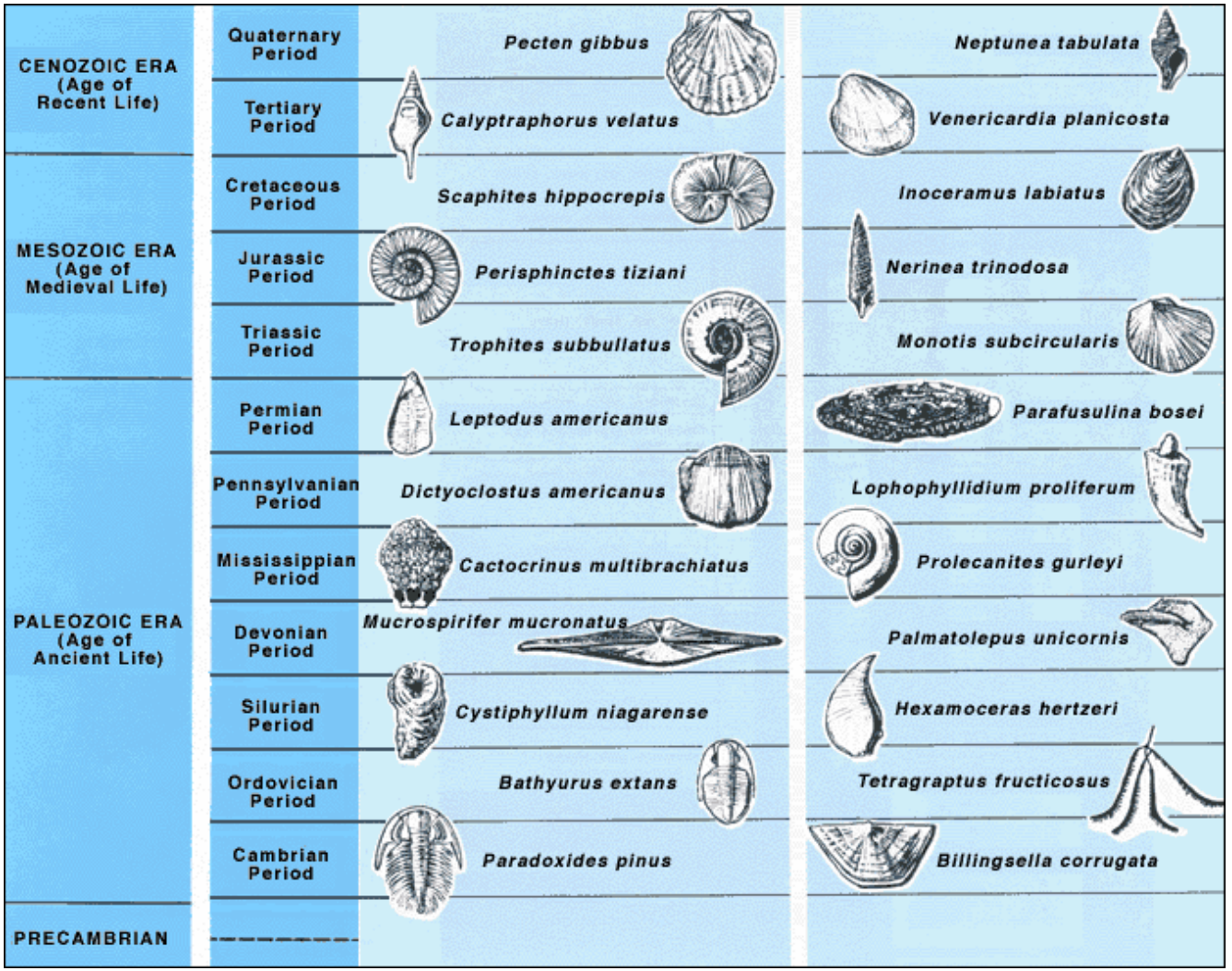
Half-life of elements

Isotope		Half-Life of Parent (y)	Effective Dating Range (y)
Parent	Daughter		
uranium-235	lead-207	710 million	> 10 million
potassium-40	argon-40	1.3 billion	10 000 to 3 billion
carbon-14	nitrogen-14	5730	up to 50 000

Half-life relative to time

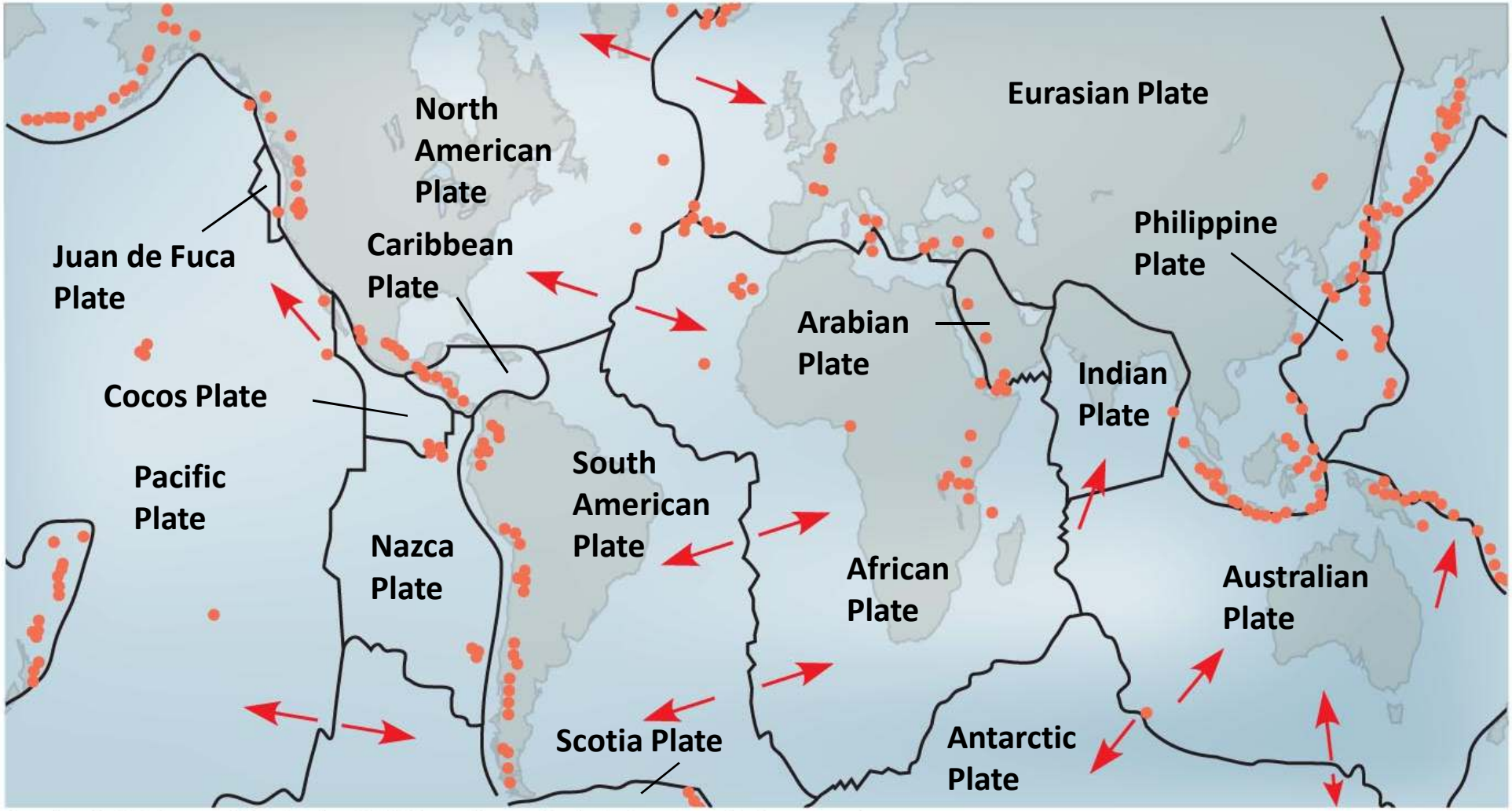


Relative fossil dating using index fossils

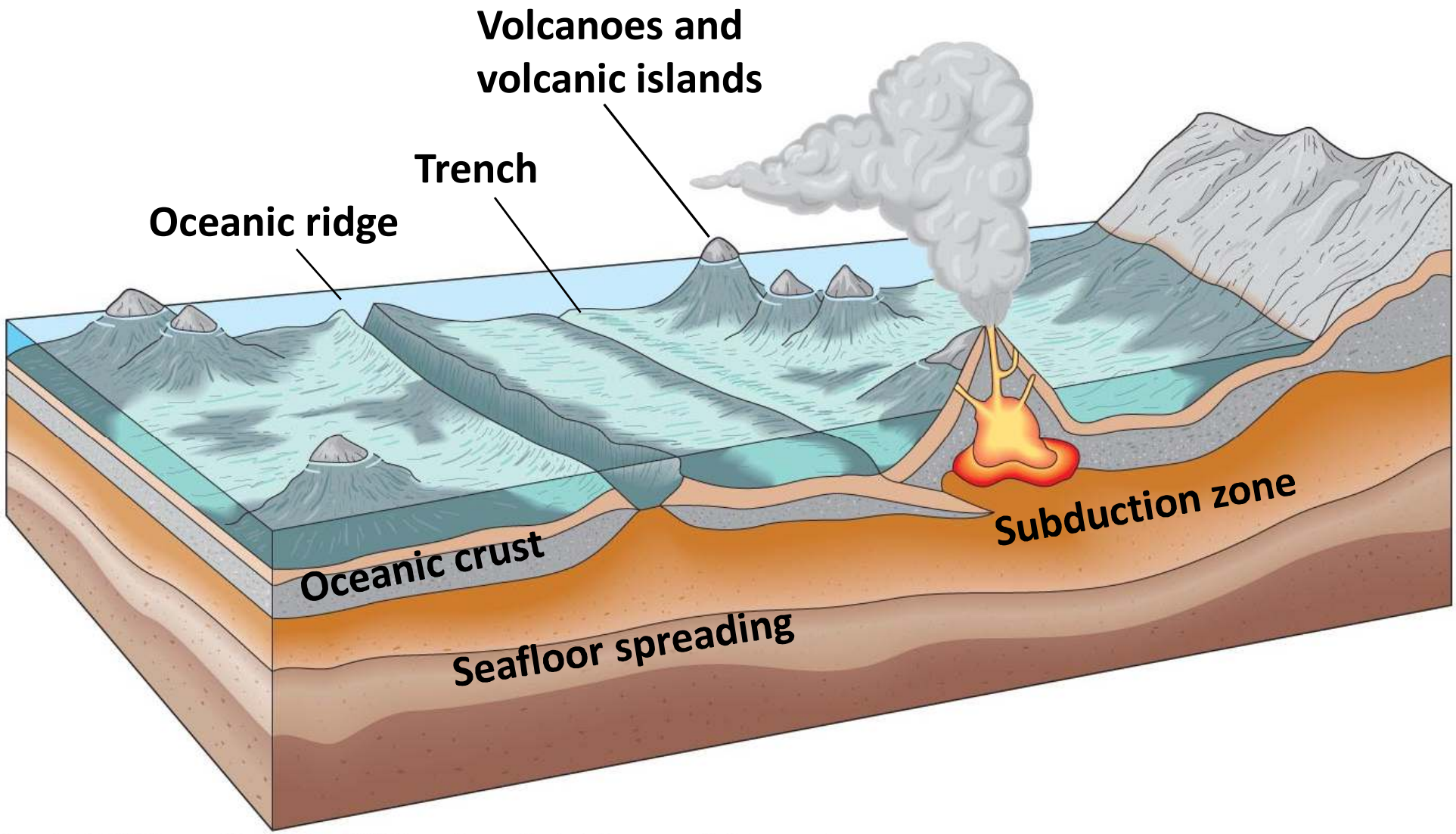


The Tectonic Plates of the Earth

Red Circles are volcanoes



Techtonics of
spreading or colliding



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Part 2

Stephen Jay Gould

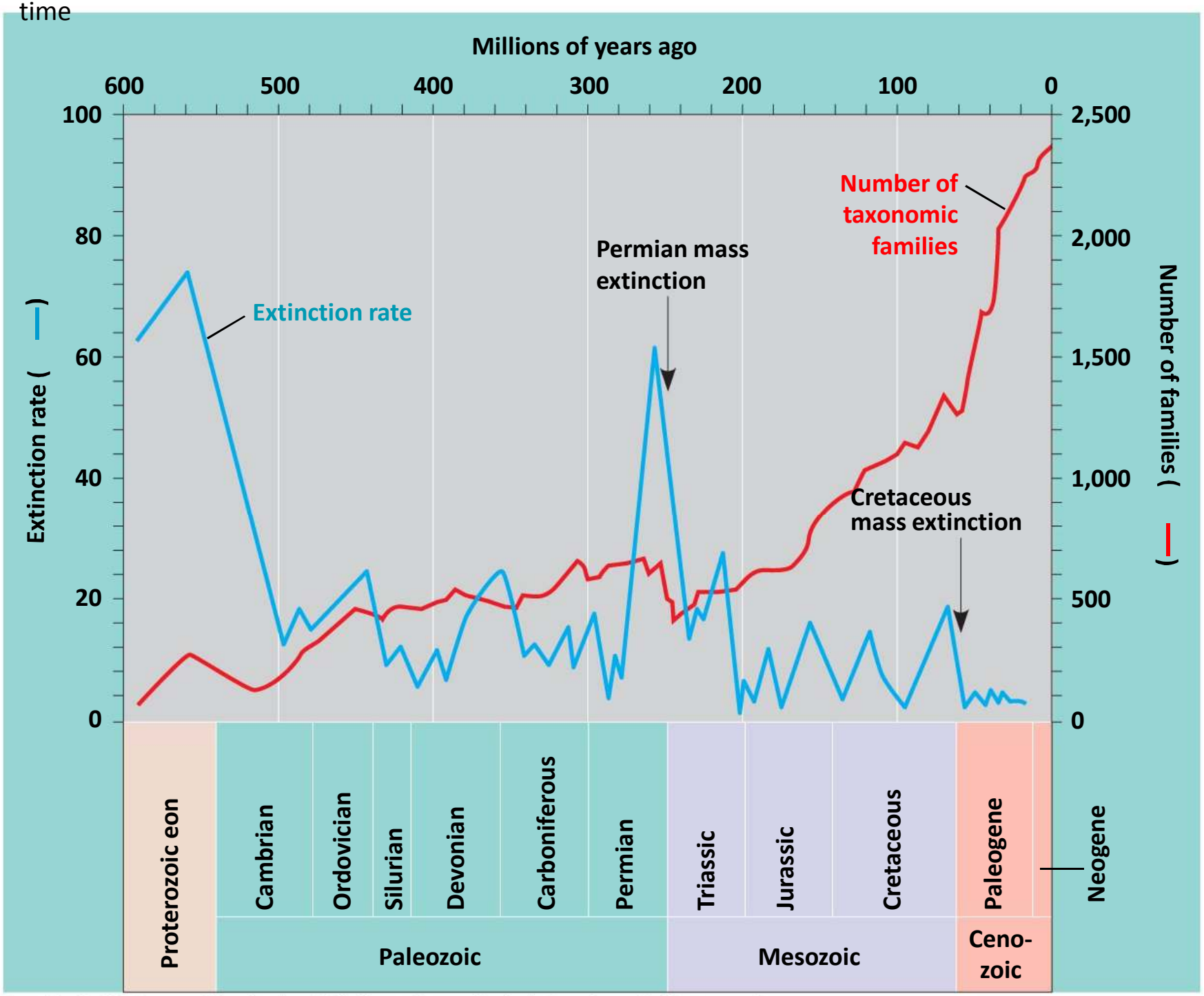
Pre AP Biology

Geologic Time and Processes (7.3)

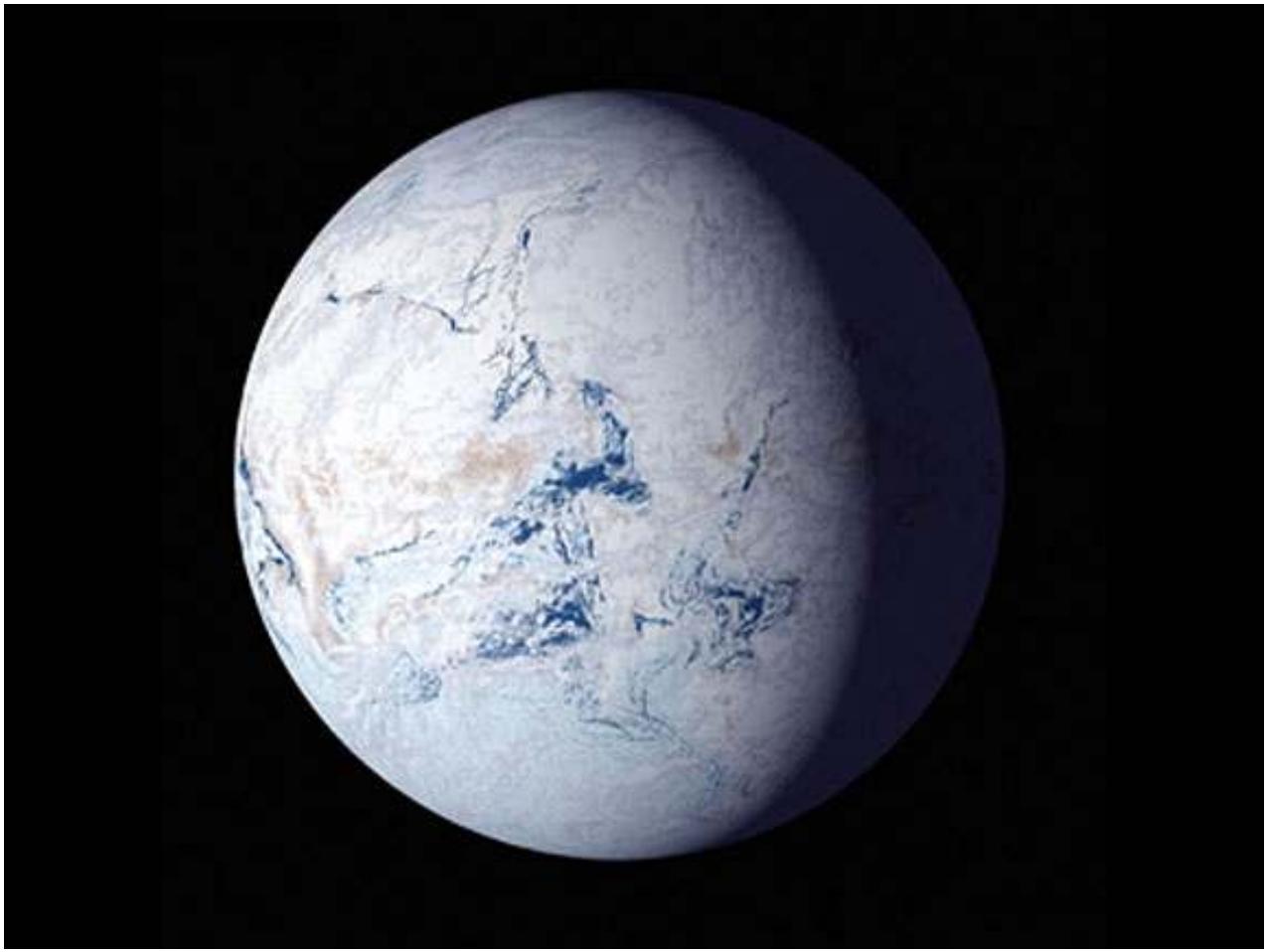
Part 3

Eon	Era	Period	Epoch	Age MYA	Important Events
Phanerozoic	Cenozoic	Neogene	Holocene	0.01	Historical time
			Pleistocene	1.8	Ice ages; humans appear
			Pliocene	5.3	Genus *Homo*
			Miocene	23	Radiation of mammals and angiosperms; apelike ancestors of humans
		Paleogene	Oligocene	33.9	Primates
			Eocene	55.8	Angiosperm dominance radiation of mammals
			Paleocene	65.5	Mammals, birds, pollinating insects
Proterozoic	Mesozoic	Cretaceous		145.5	Angiosperms; Cretaceous extinction
		Jurassic		199.6	Gymnosperms; dinosaurs
		Triassic		251	Gymnosperms; dinosaurs; mammal-like reptiles
	Paleozoic	Permian		299	Permian extinction
		Carboniferous		359.2	Seed plants; reptiles
		Devonian		416	Bony fishes; tetrapods; insects
		Silurian		443.7	Early vascular plants
		Ordovician		488.3	Colonization of land
		Cambrian		542	Cambrian explosion
Archaean				600	Algae; soft-bodied invertebrates
				2,200	Oldest fossils of eukaryotes
				2,500	
				2,700	Atmospheric oxygen increases
				3,500	Oldest fossils of prokaryotes
				3,800	Oldest known rocks
				Approx. 4,600	Origin of Earth

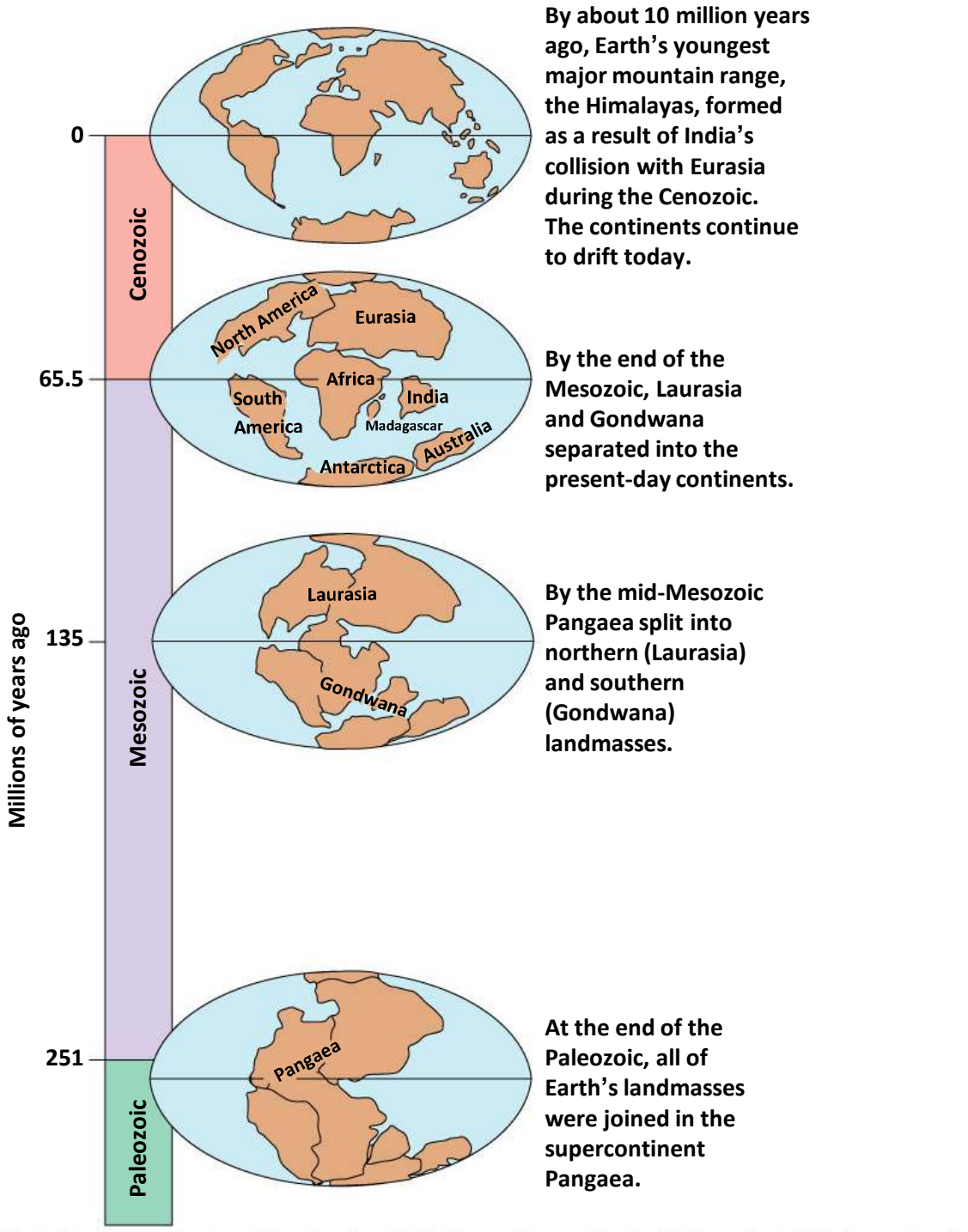
Mass extinctions over time



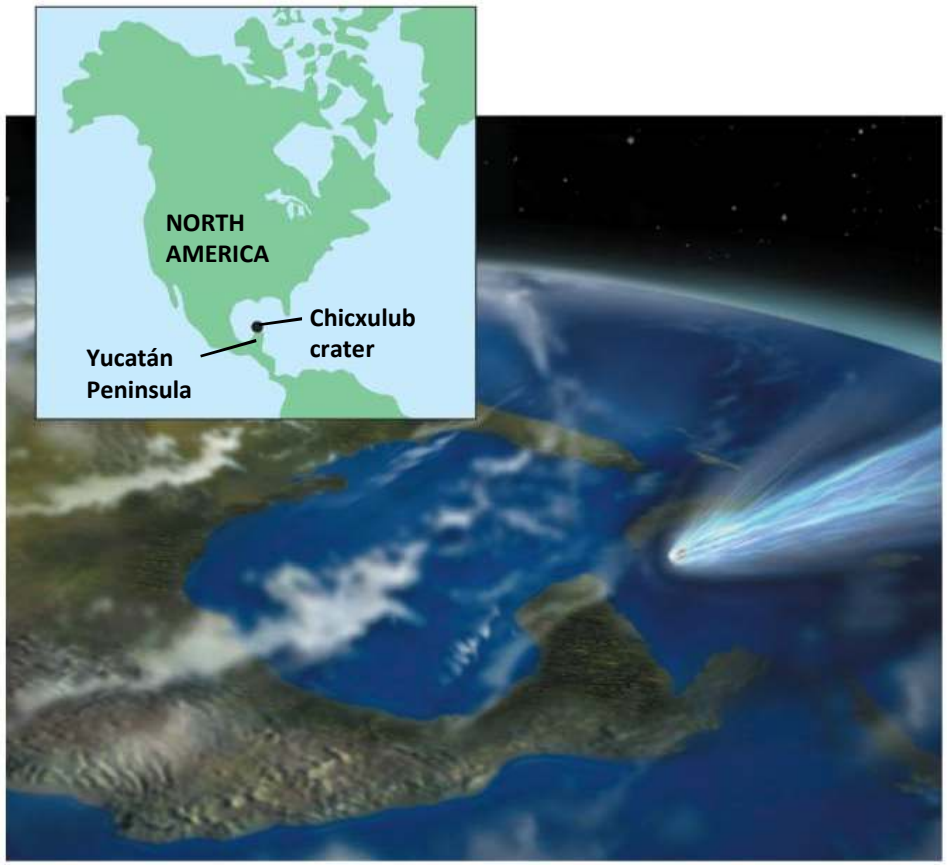
Snowball Earth



Pangaea



Asteroid Impact



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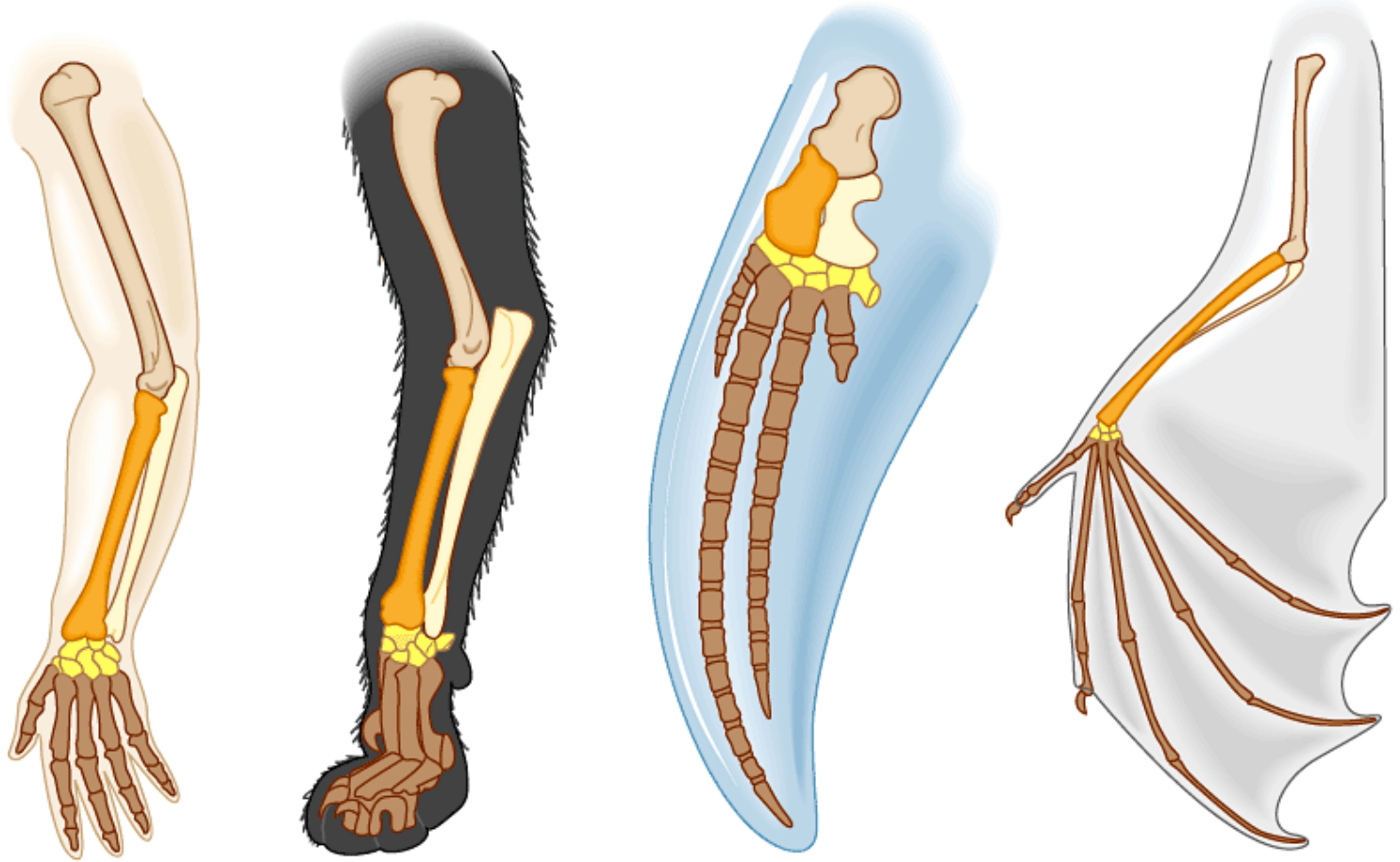
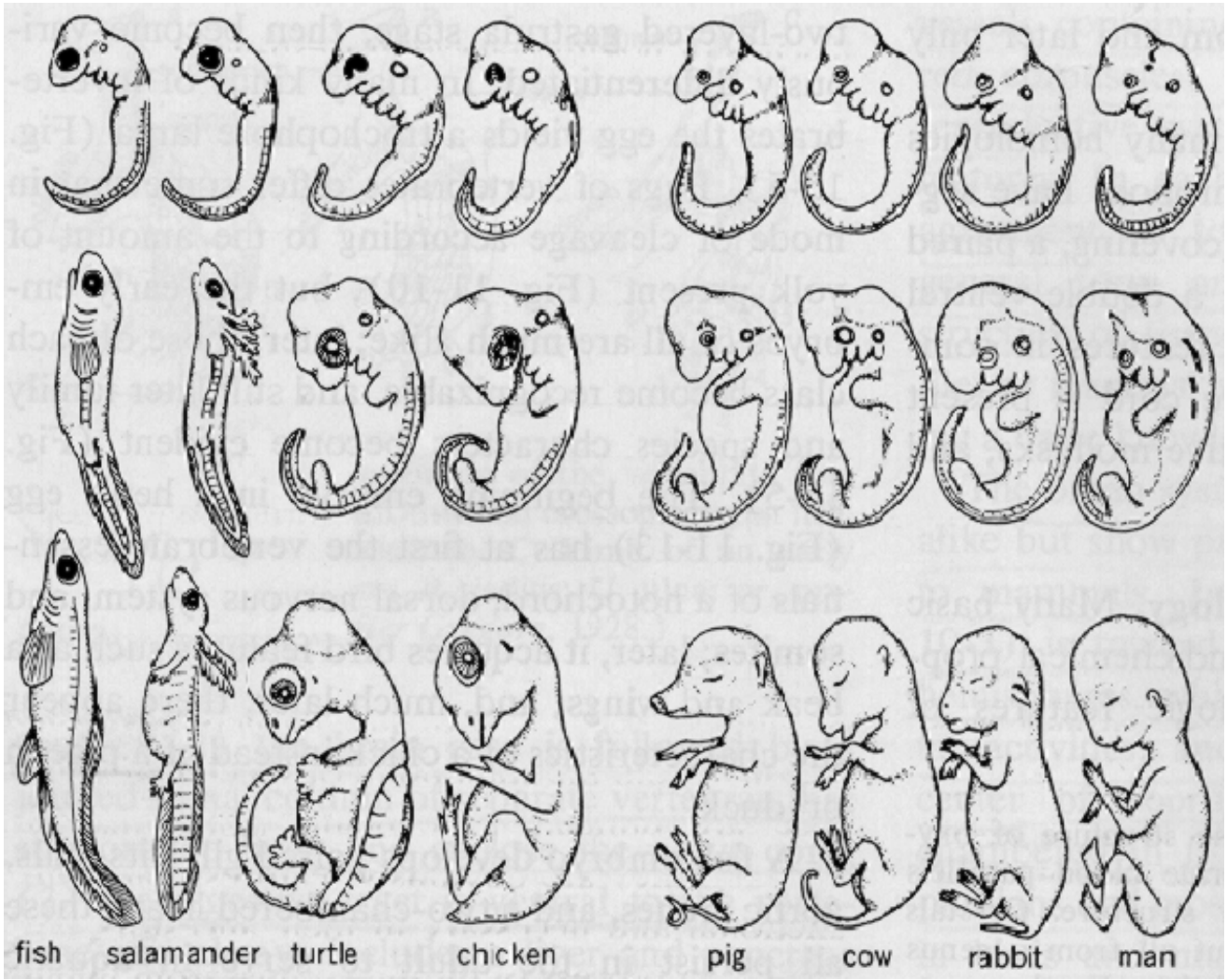
Part 4

Supporting Evidence
Homologous Structures



Supporting Evidence
Embryological Homologies

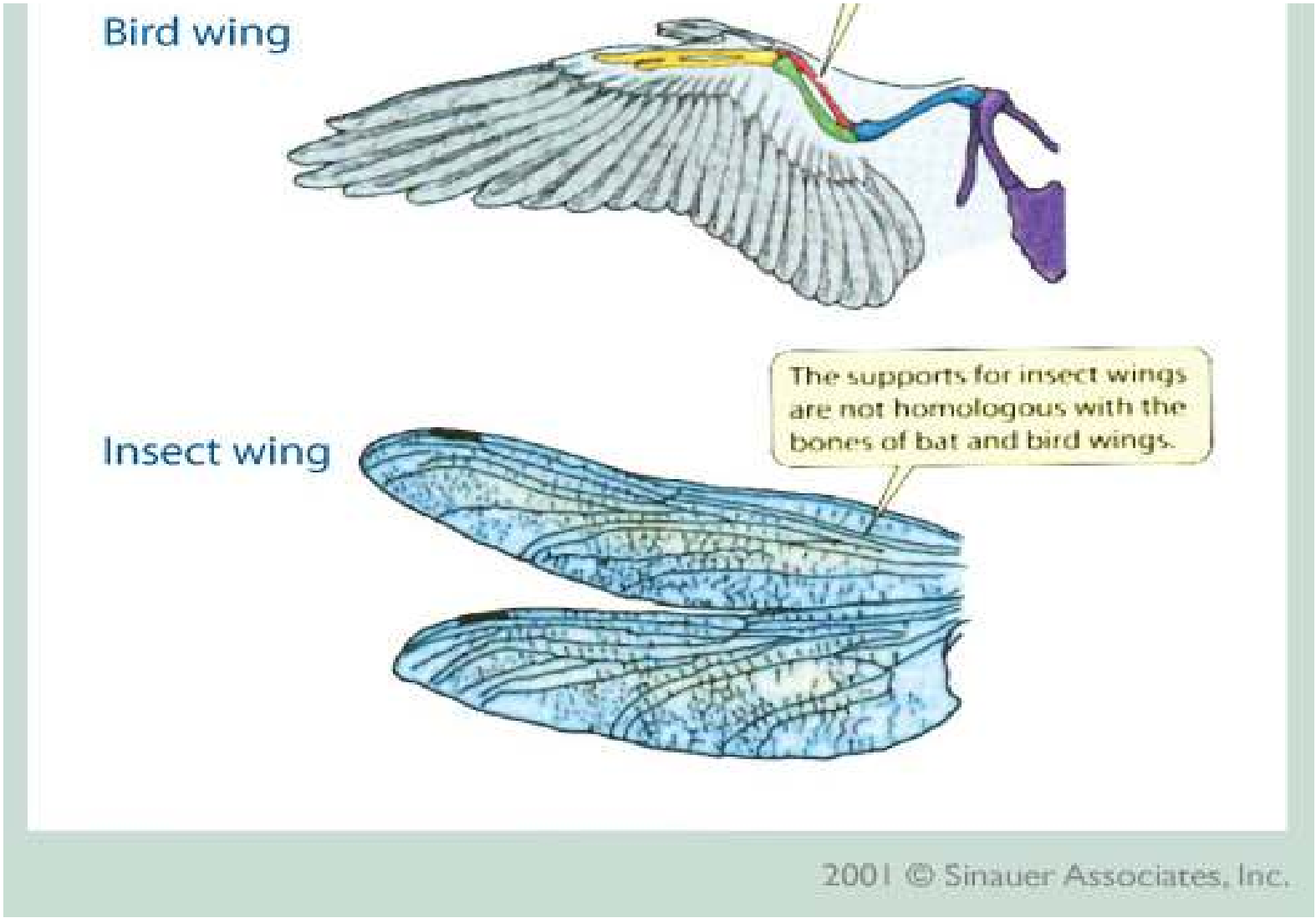


Supporting Evidence
Molecular Homologies

Table 22.1 Molecular Data and the Evolutionary Relationships of Vertebrates

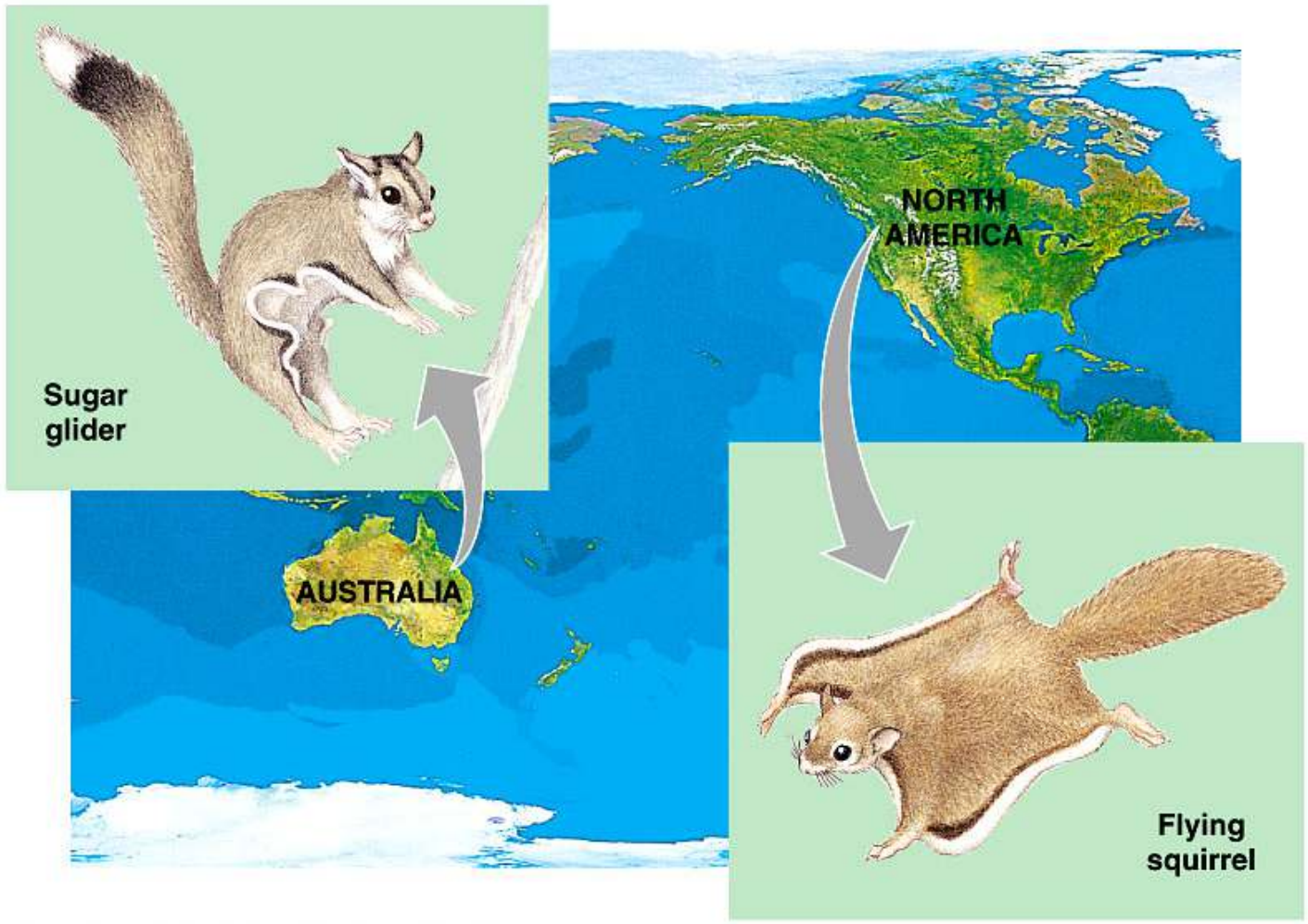
Species	Number of Amino Acids That Differ from a Human Hemoglobin Polypeptide (Total Chain Length = 146 Amino Acids)
Human 	0
Rhesus monkey 	8
Mouse 	27
Chicken 	45
Frog 	67
Lamprey 	125

Analogous Structures



Biogeography and Convergent Evolution

Similar environments - similar appearance

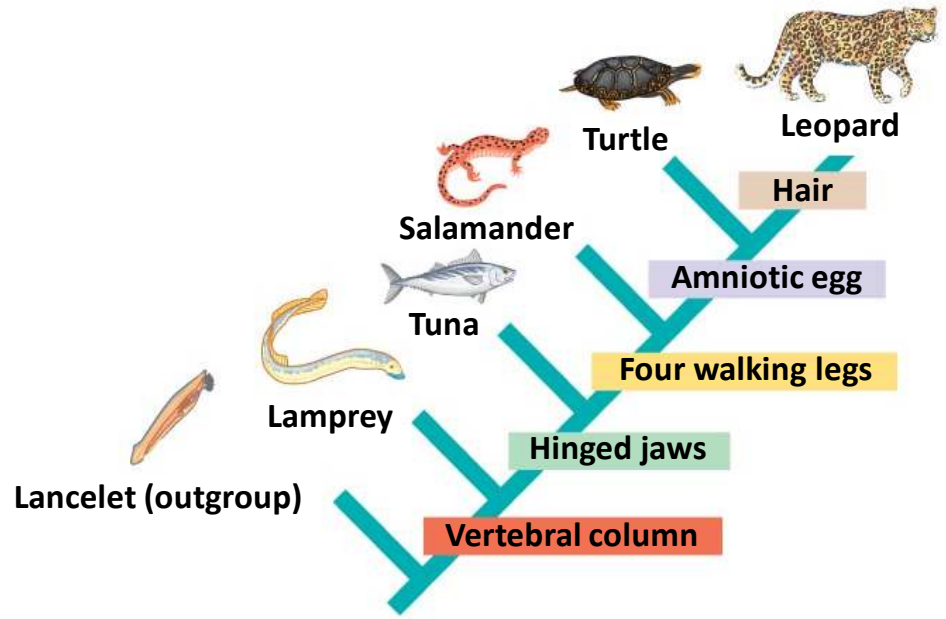


Character Table used to create a Cladogram

TAXA

CHARACTERS	Lancelet (outgroup)	Lamprey	Tuna	Salamander	Turtle	Leopard
Hair	0	0	0	0	0	1
Amniotic (shelled) egg	0	0	0	0	1	1
Four walking legs	0	0	0	1	1	1
Hinged jaws	0	0	1	1	1	1
Vertebral column (backbone)	0	1	1	1	1	1

(a) Character table



(b) Cladogram