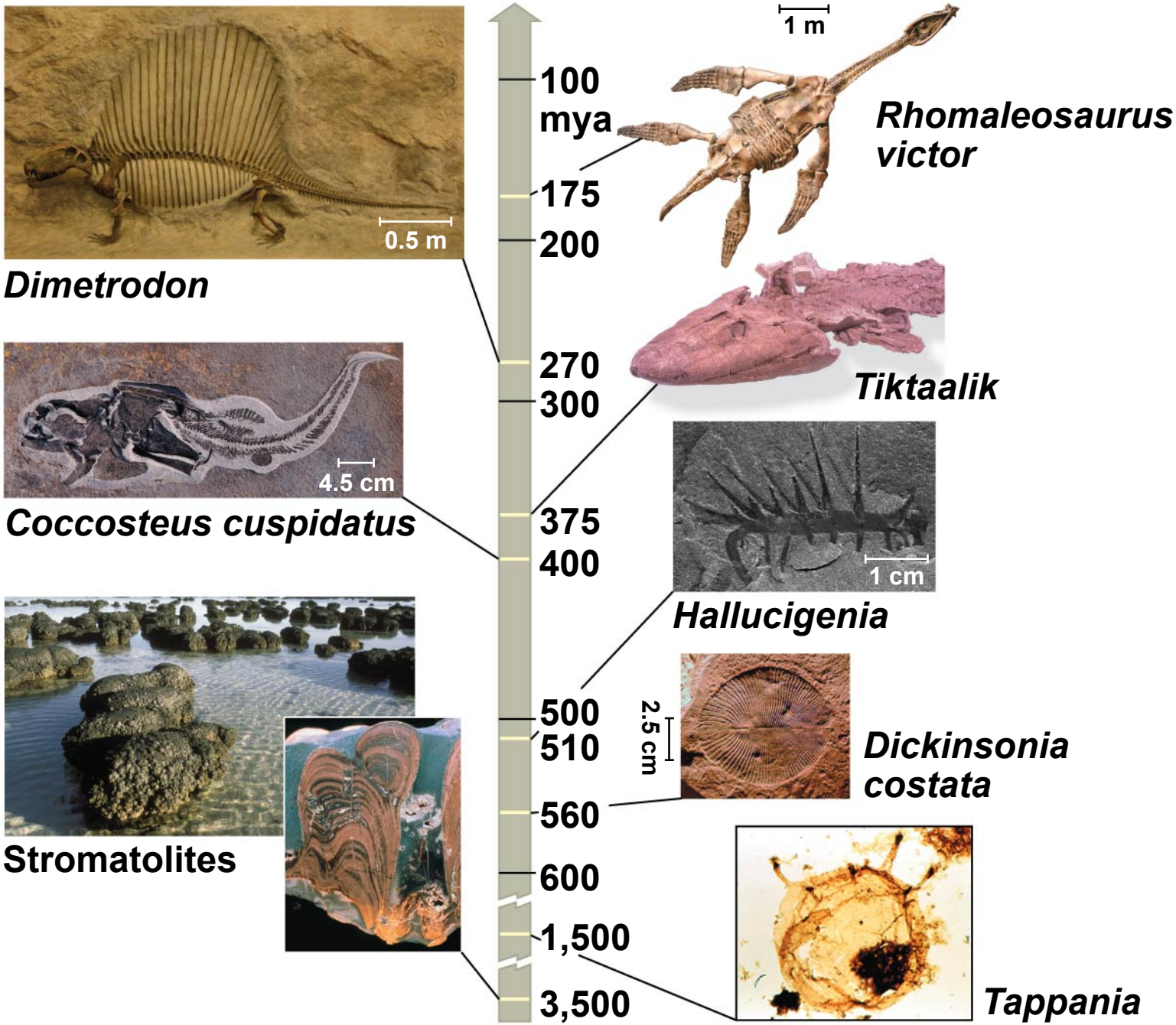
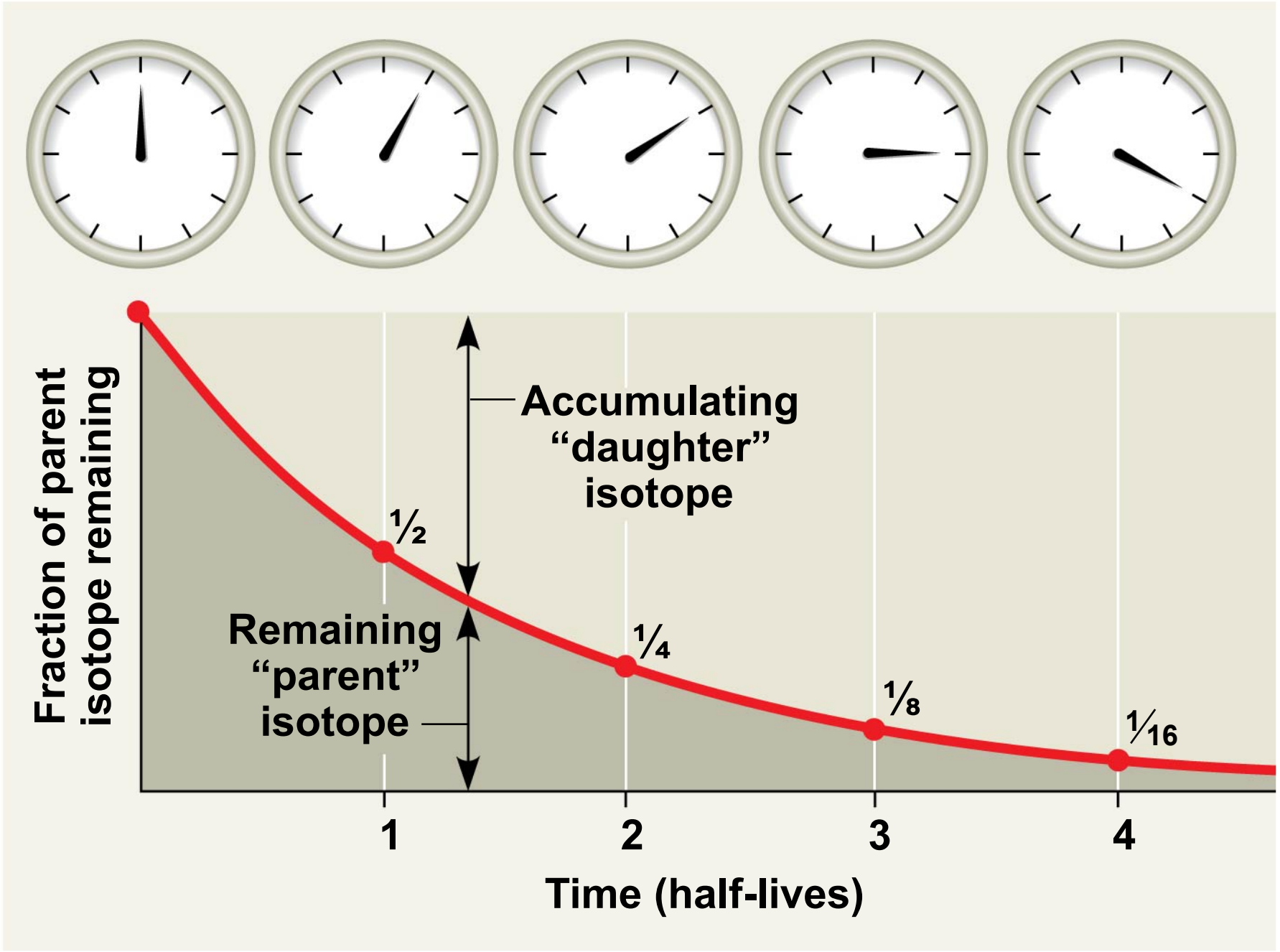
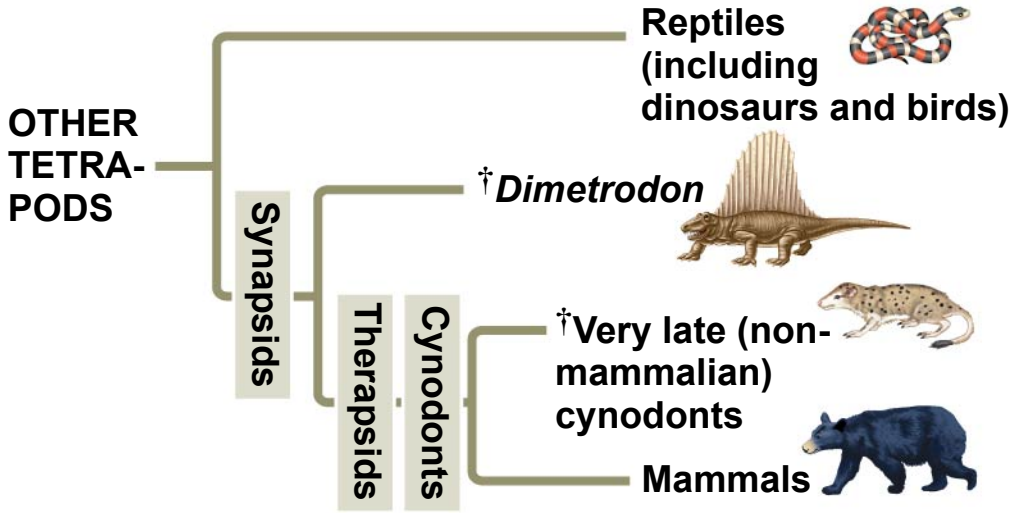
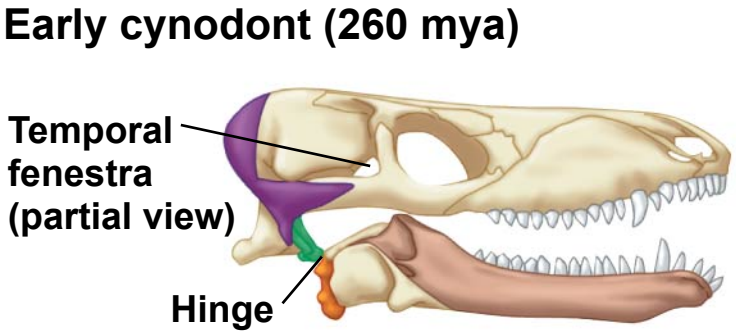
Table 23.1 The Geologic Record

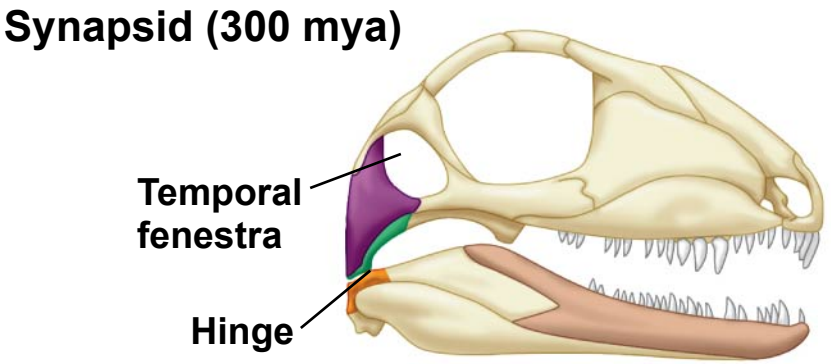
Relative Duration of Eons	Era	Period	Epoch	Age (Millions of Years Ago)	Some Important Events in the History of Life
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	Historical time
			Pleistocene	2.6	Ice ages; origin of genus *Homo*
		Neogene	Pliocene	5.3	Appearance of bipedal human ancestors
			Miocene	23	Continued radiation of mammals and angiosperms; earliest direct human ancestors
		Paleogene	Oligocene	33.9	Origins of many primate groups
			Eocene	55.8	Angiosperm dominance increases; continued radiation of most present-day mammalian orders
			Paleocene	65.5	Major radiation of mammals, birds, and pollinating insects
Proterozoic	Mesozoic	Cretaceous		145.5	Flowering plants (angiosperms) appear and diversify; many groups of organisms, including most dinosaurs, become extinct at end of period
		Jurassic		199.6	Gymnosperms continue as dominant plants; dinosaurs abundant and diverse
		Triassic		251	Cone-bearing plants (gymnosperms) dominate landscape; dinosaurs evolve and radiate; origin of mammals
Archaean	Paleozoic	Permian		299	Radiation of reptiles; origin of most present-day groups of insects; extinction of many marine and terrestrial organisms at end of period
		Carboniferous		359	Extensive forests of vascular plants form; first seed plants appear; origin of reptiles; amphibians dominant
		Devonian		416	Diversification of bony fishes; first tetrapods and insects appear
		Silurian		444	Diversification of early vascular plants
		Ordovician		488	Marine algae abundant; colonization of land by diverse fungi, plants, and animals
		Cambrian		542	Sudden increase in diversity of many animal phyla (Cambrian explosion)
		Ediacaran		635	Diverse algae and soft-bodied invertebrate animals appear
				1,800	Oldest fossils of eukaryotic cells appear
				2,500	
Hadean				2,700	Concentration of atmospheric oxygen begins to increase
				3,500	Oldest fossils of cells (prokaryotes) appear
				3,850	Oldest known rocks on Earth's surface
				Approx. 4,600	Origin of Earth

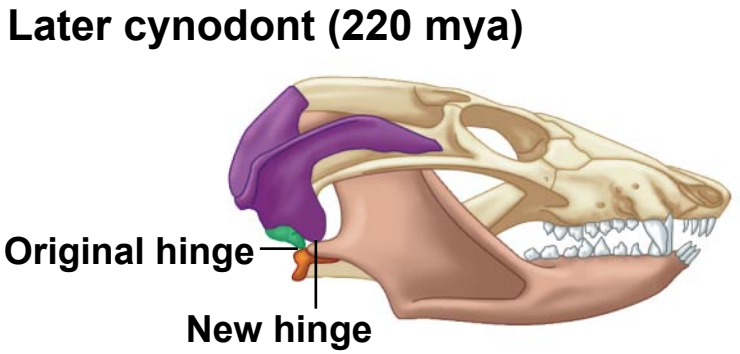


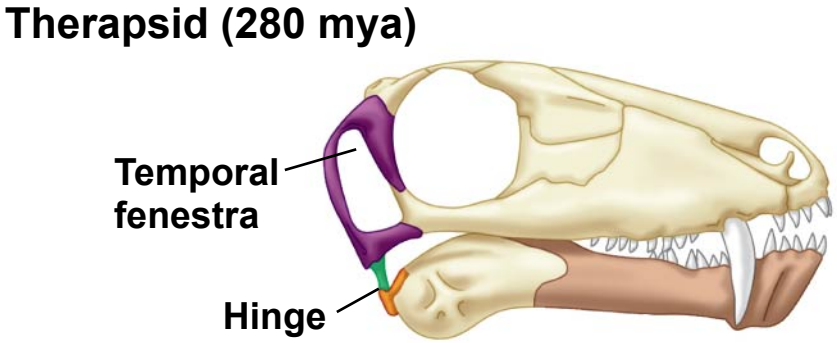


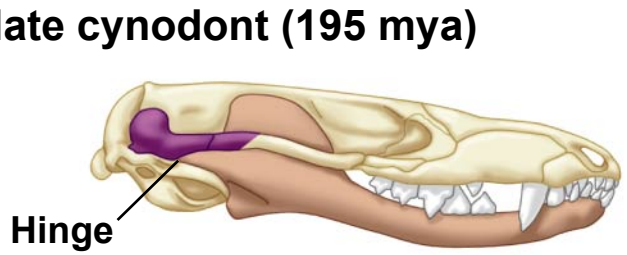


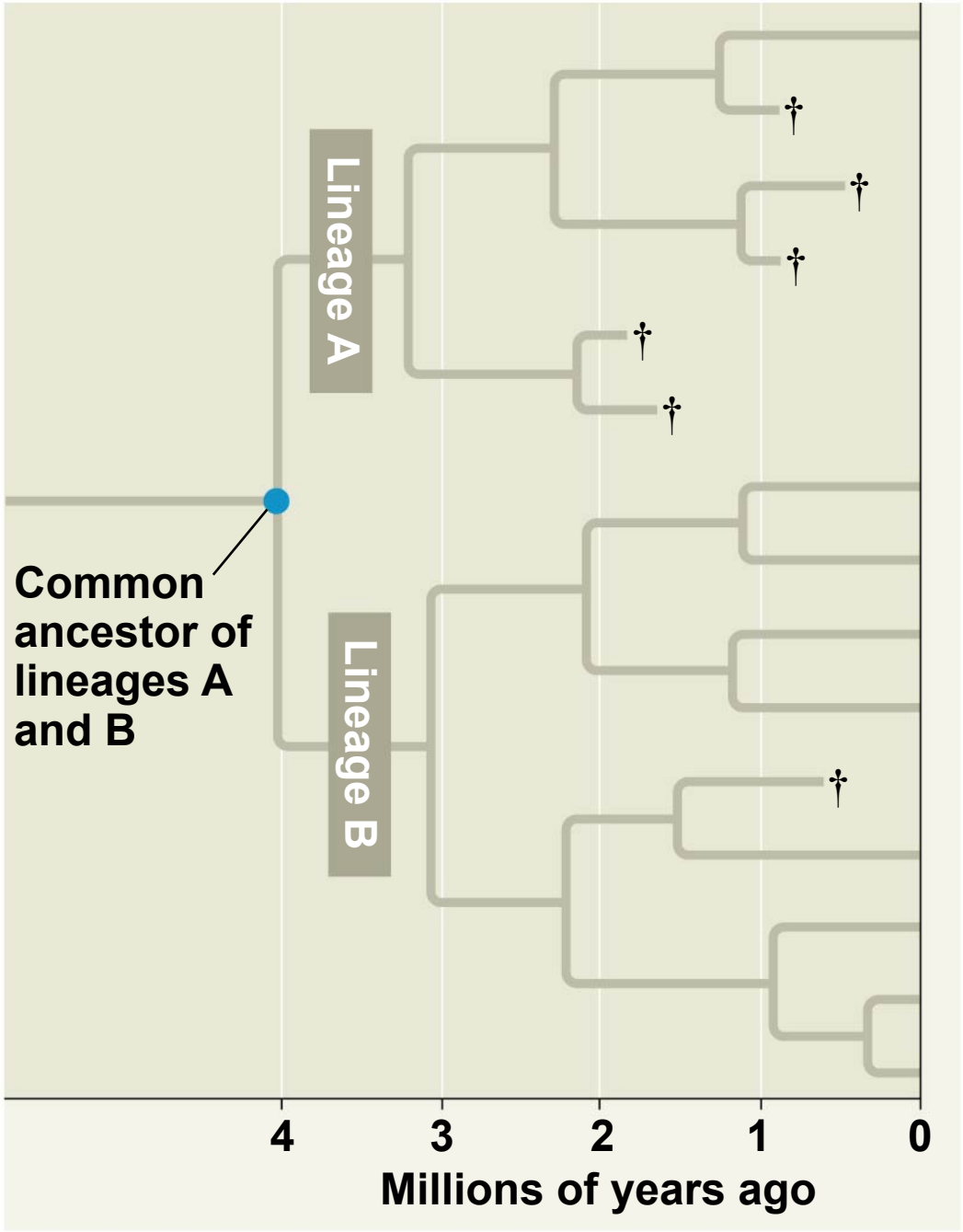


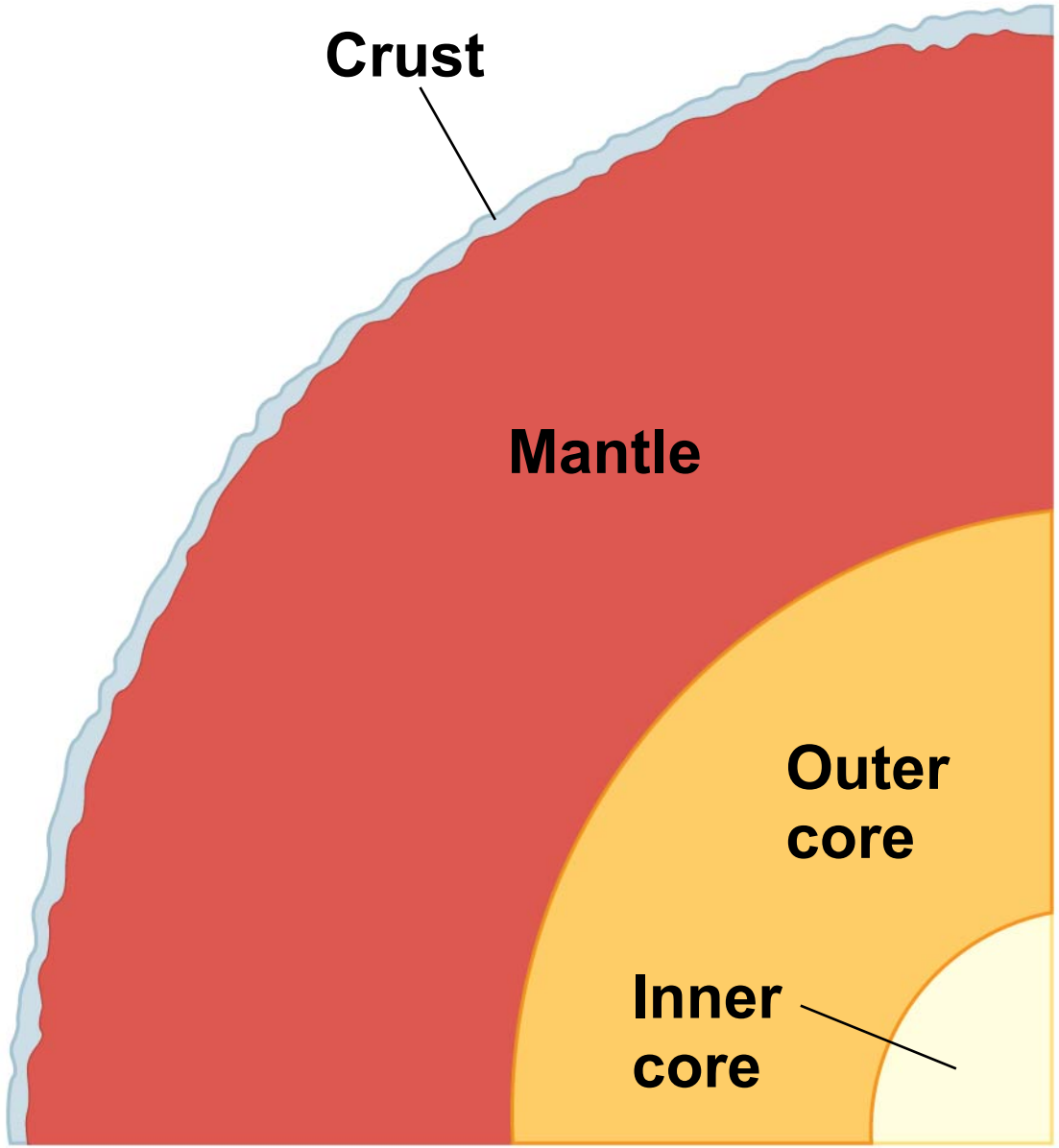


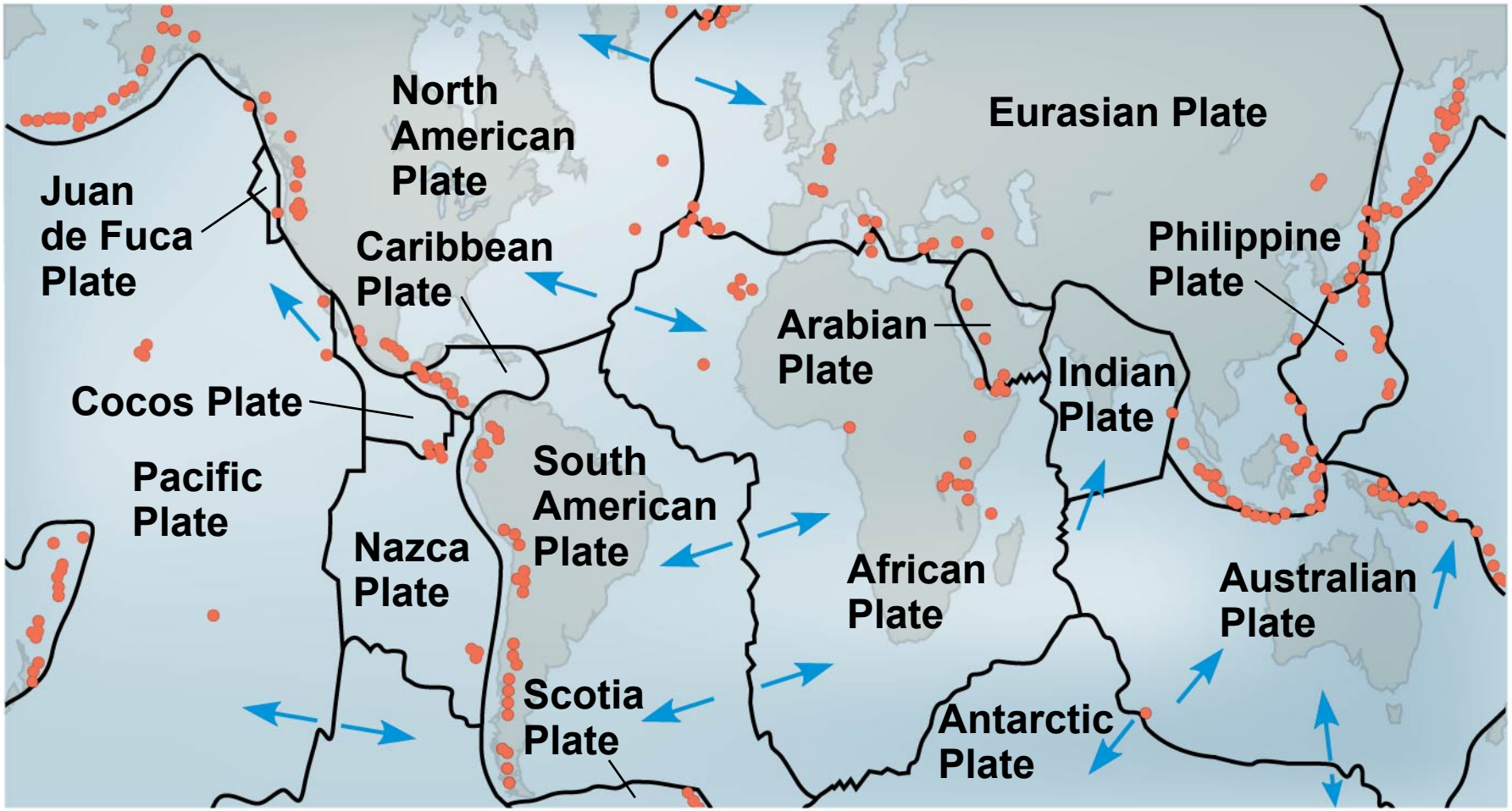


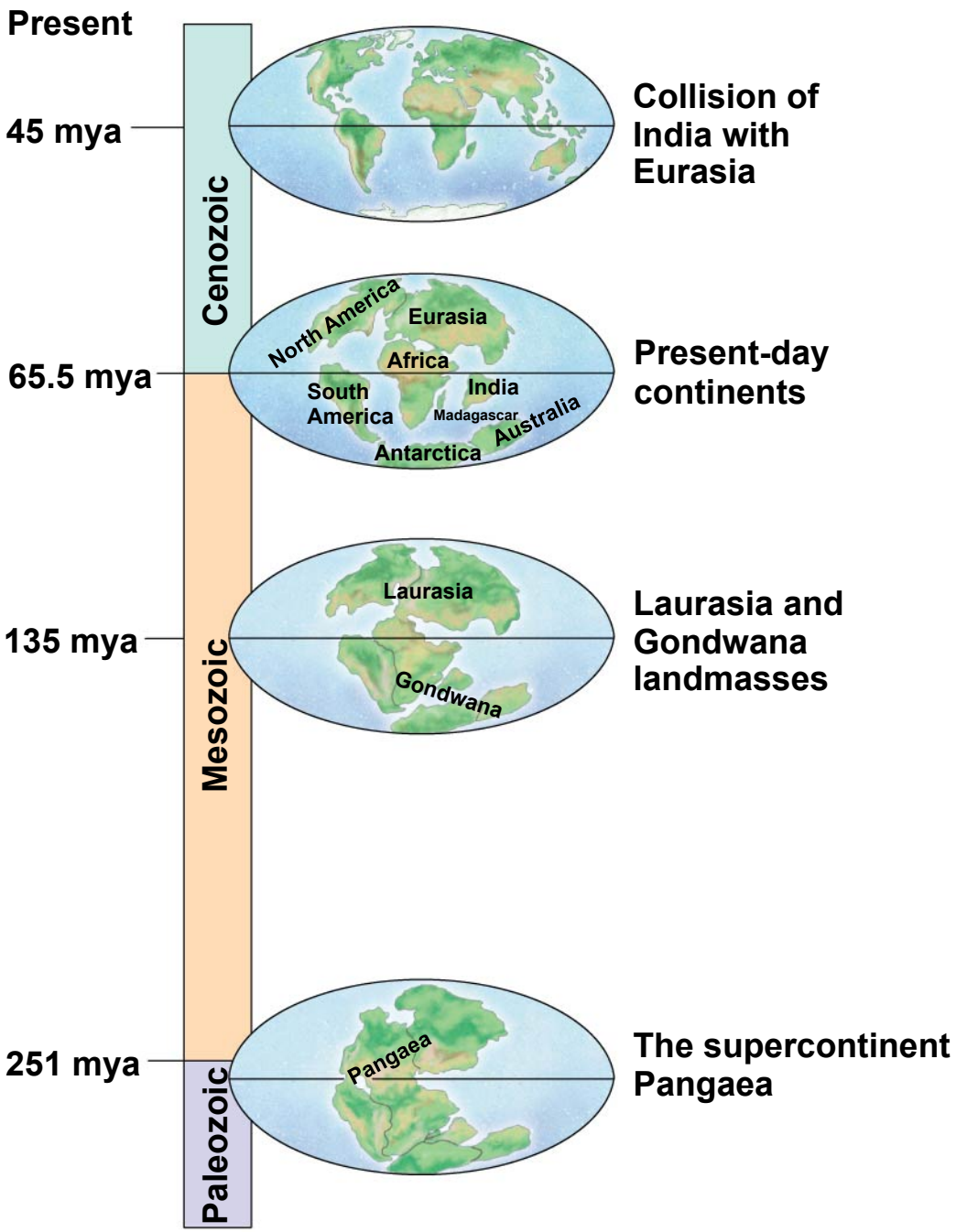


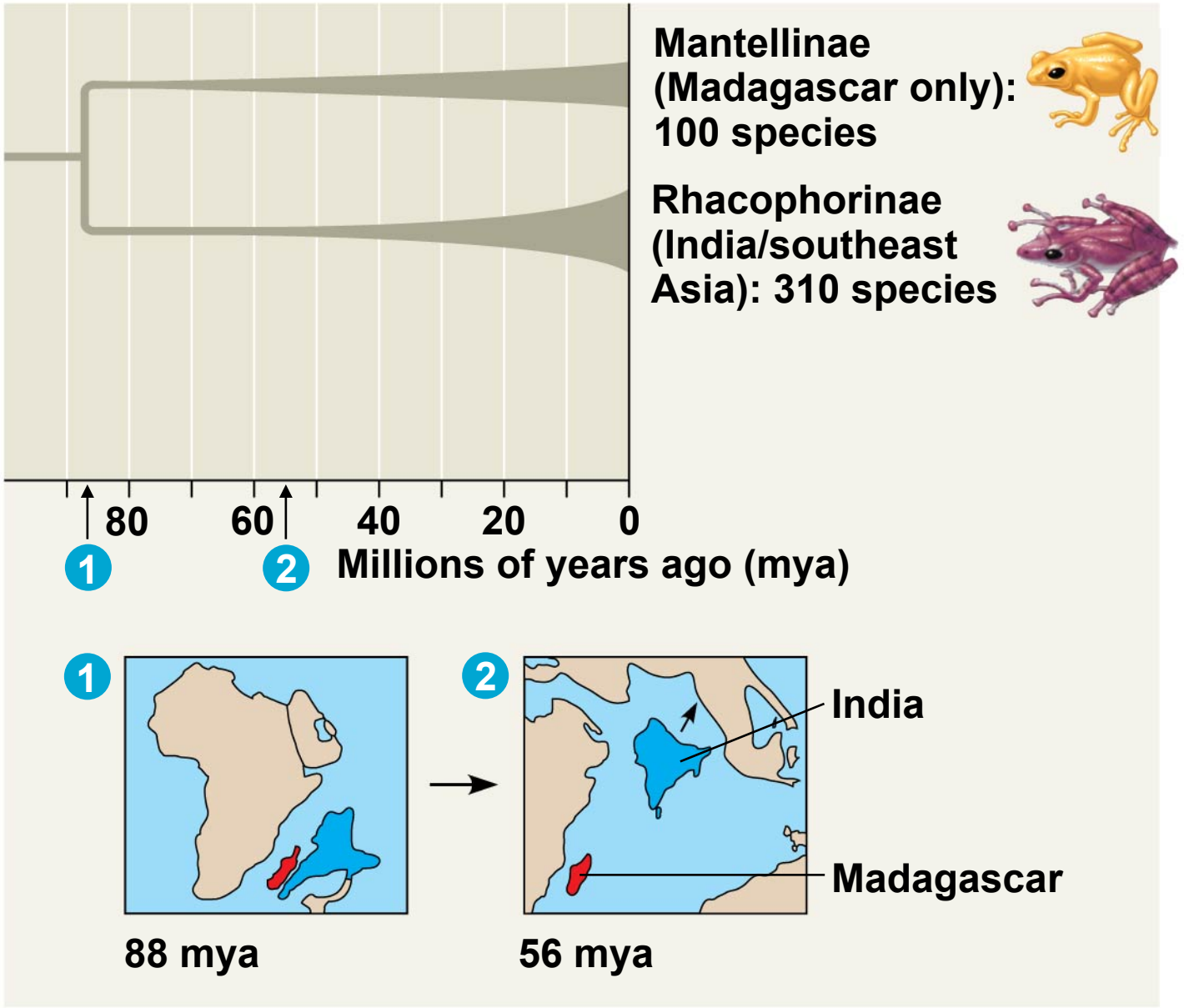


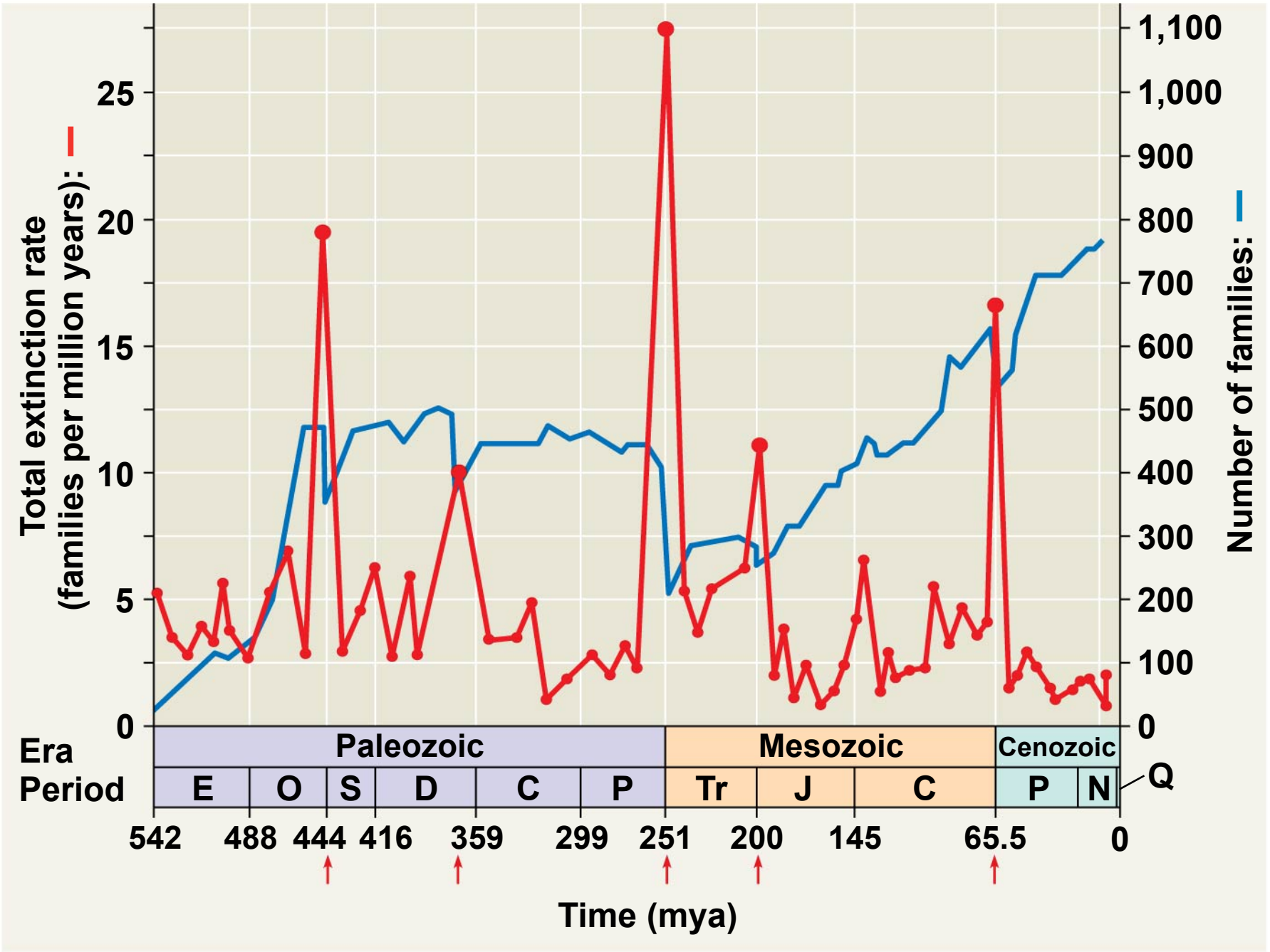


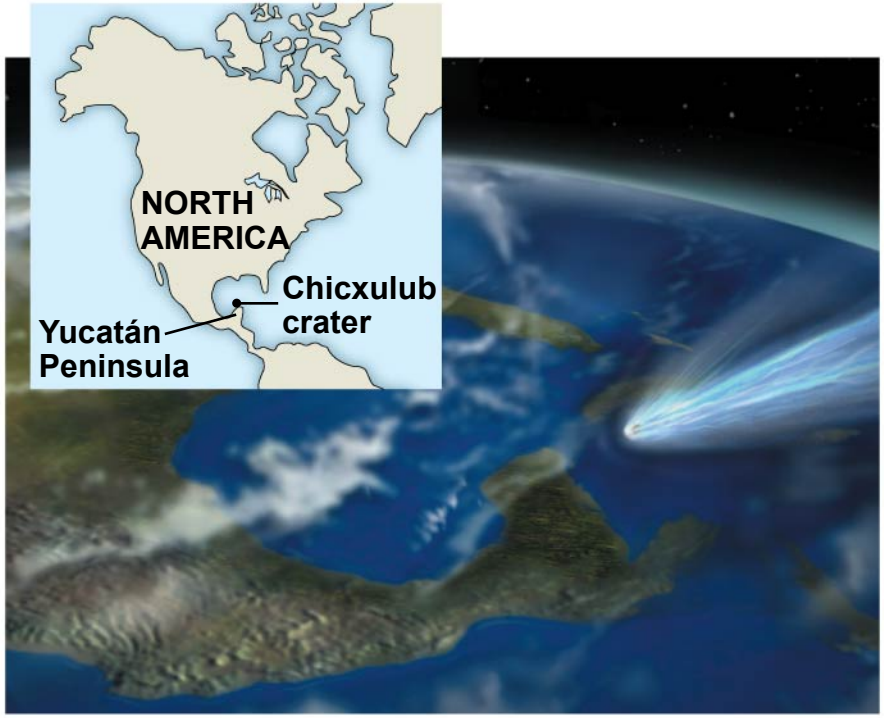


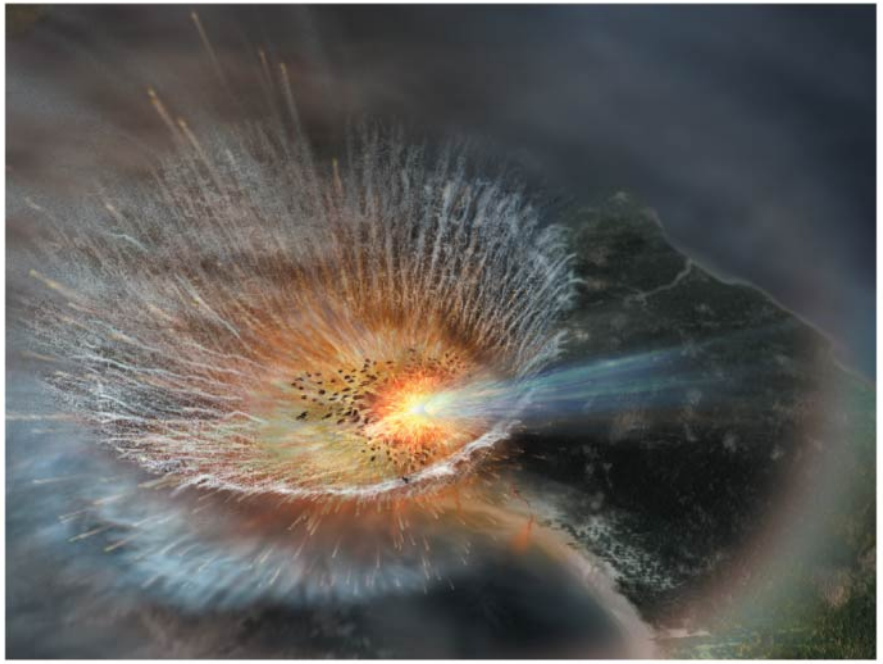


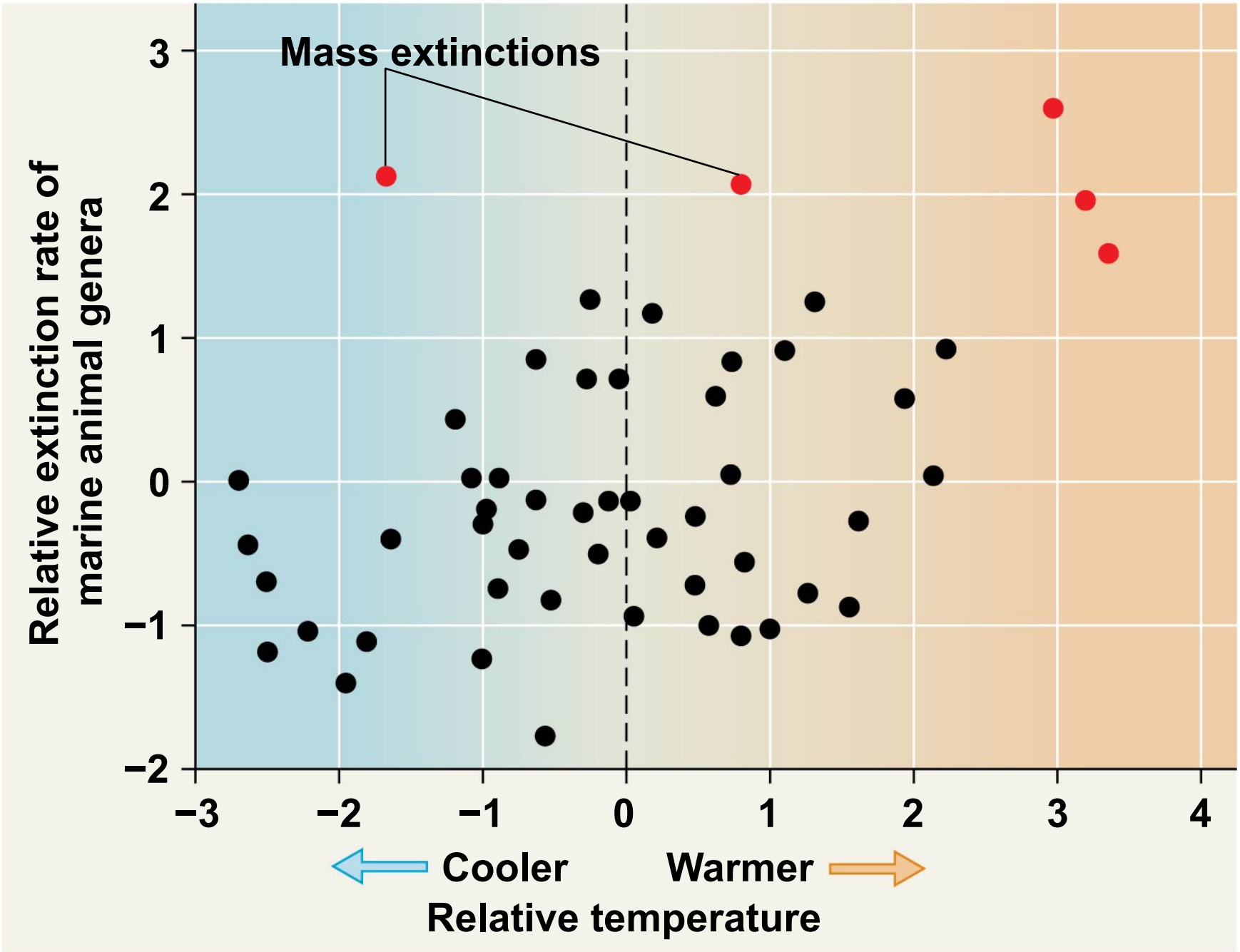


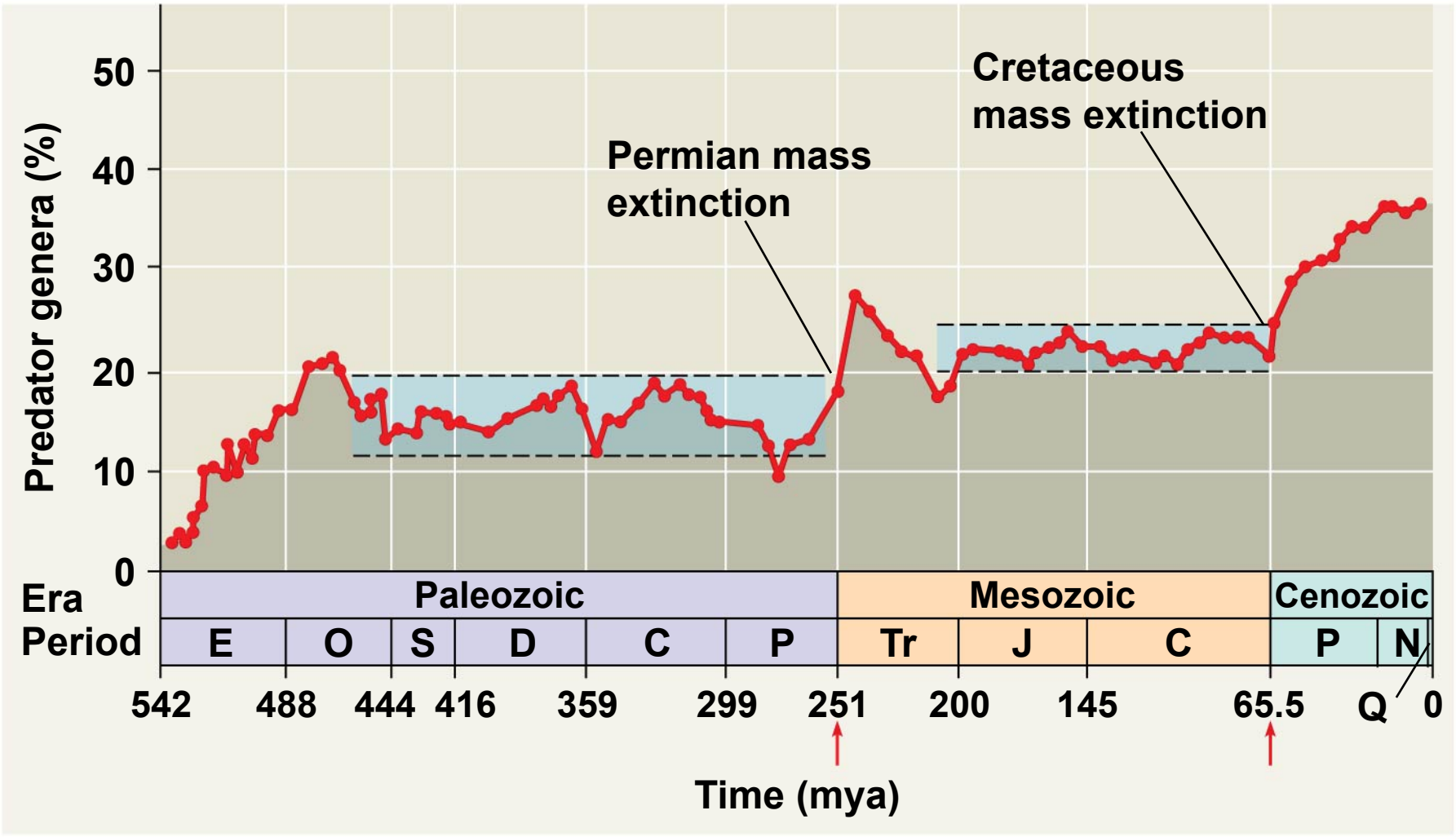


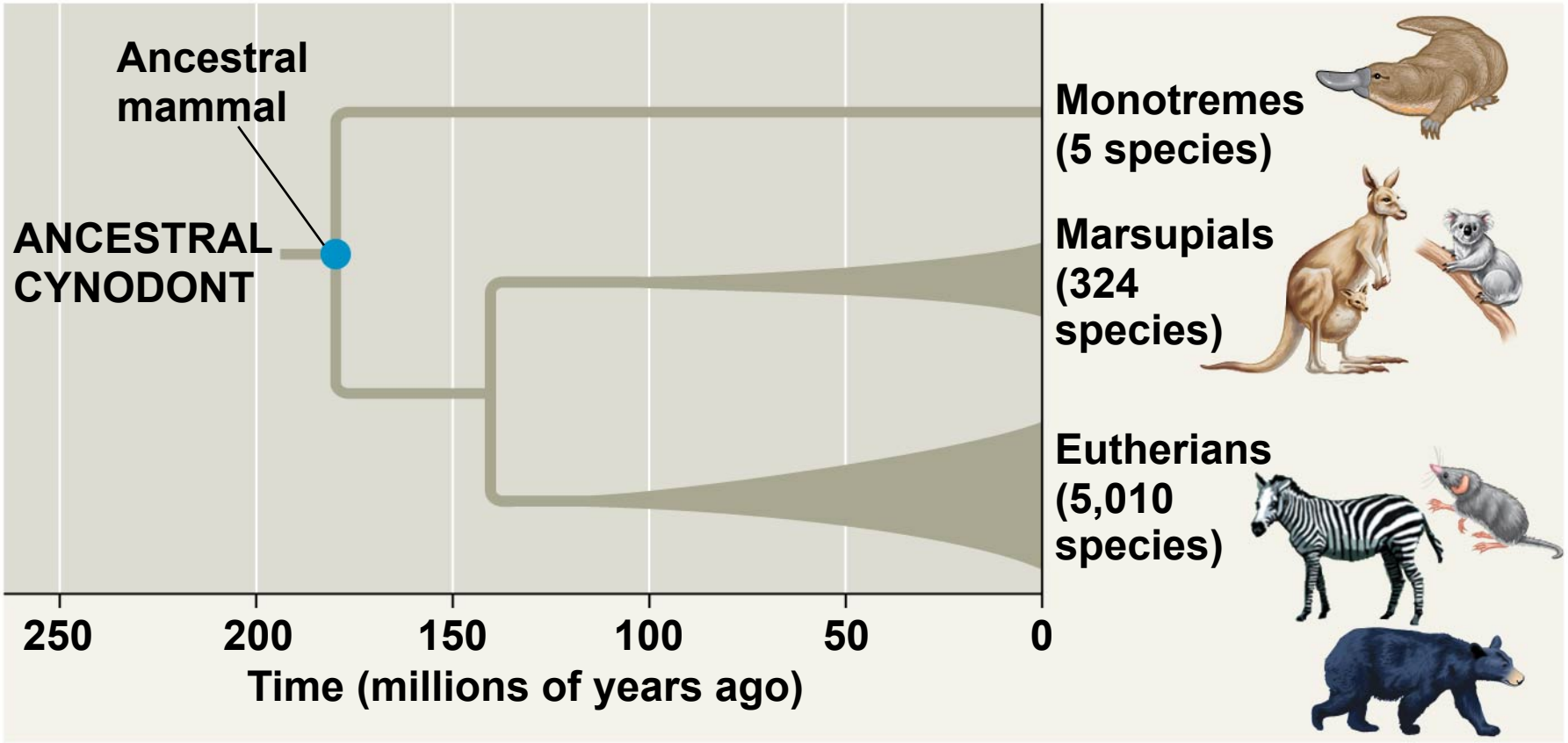








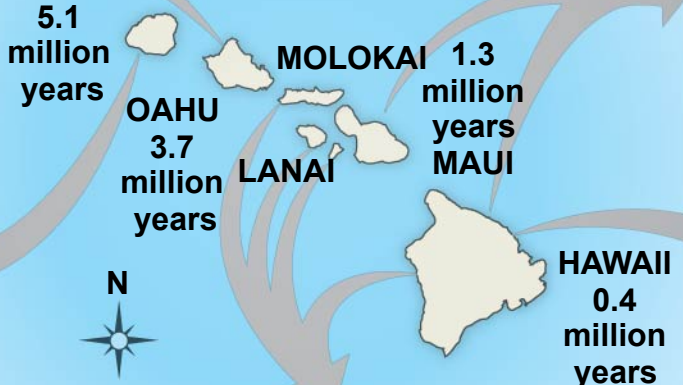




Dubautia laxa

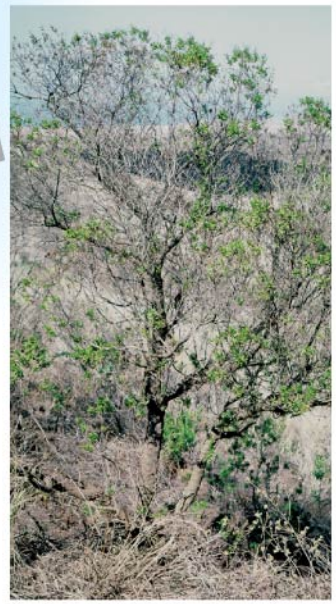
Close North American relative, the tarweed *Carlquistia muirii*

Argyroxiphium sandwicense



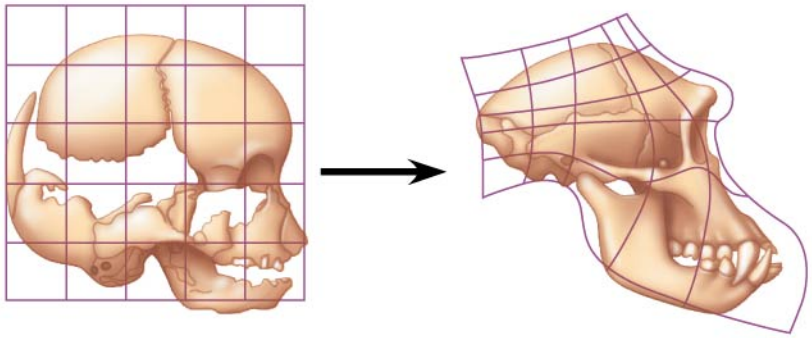
Dubautia waialealae

Dubautia scabra

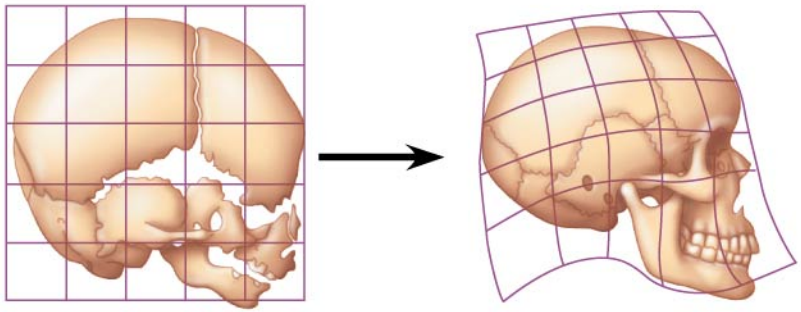


Dubautia linearis

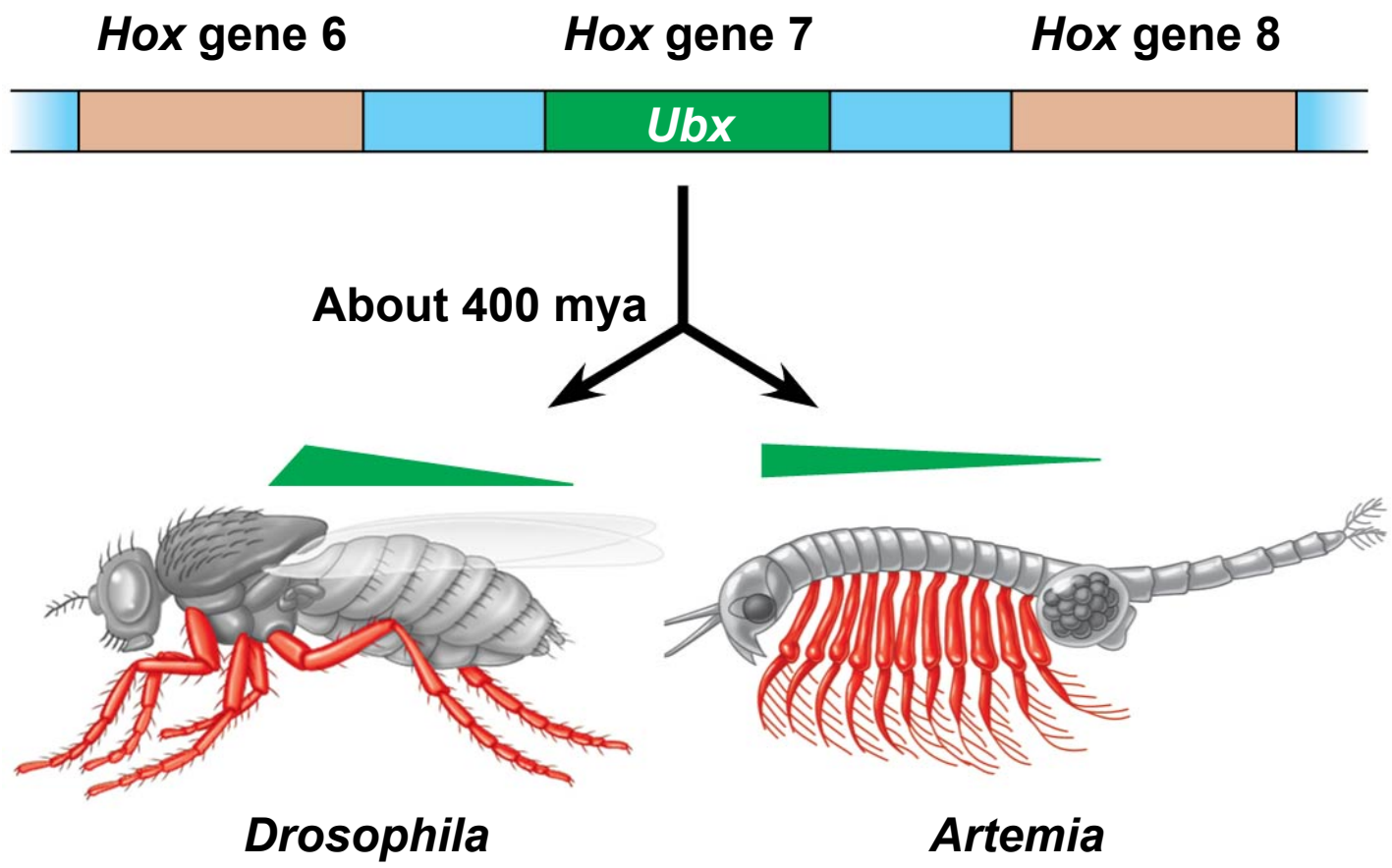
Chimpanzee infant Chimpanzee adult



Chimpanzee fetus Chimpanzee adult



Human fetus Human adult



Results

Hypothesis A: Differences in sequence

Result: No
The 283 amino acids of the *Pitx1* protein are identical.

Hypothesis B: Differences in expression

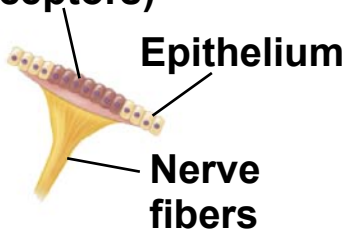
Result: Yes

Marine stickleback embryo: expression in ventral spine and mouth regions

Lake stickleback embryo: expression only in mouth regions

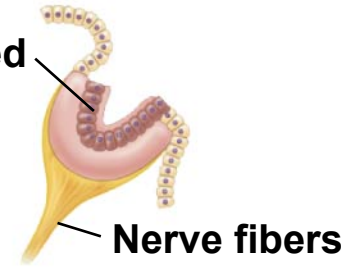
Red arrows indicate regions of *Pitx1* expression.

(a) Patch of pigmented cells



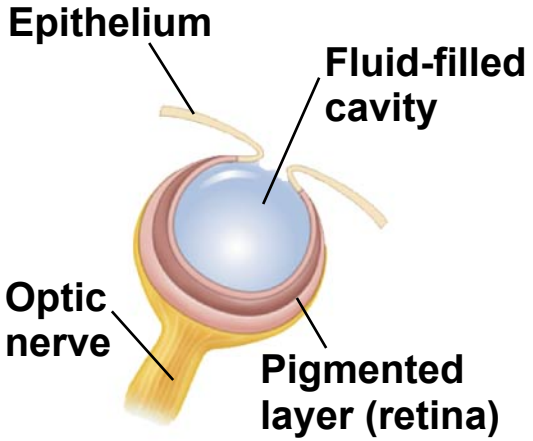
Example: *Patella,* a limpet

(b) Eyecup



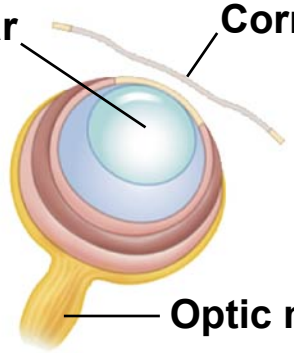
Example: *Pleurotomaria,* a slit shell mollusc

(c) Pinhole camera-type eye



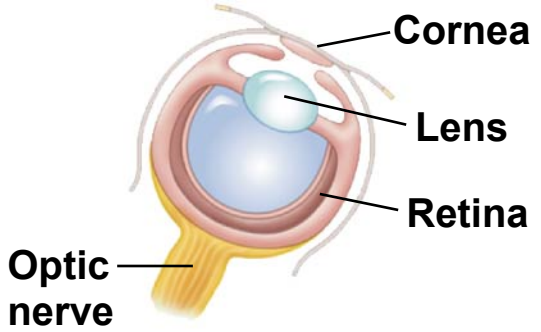
Example: *Nautilus*

(d) Eye with primitive lens



Example: *Murex,* a marine snail

(e) Complex camera lens-type eye



Example: *Loligo,* a squid