Celebrating 4.5 Billion Years of Westchester

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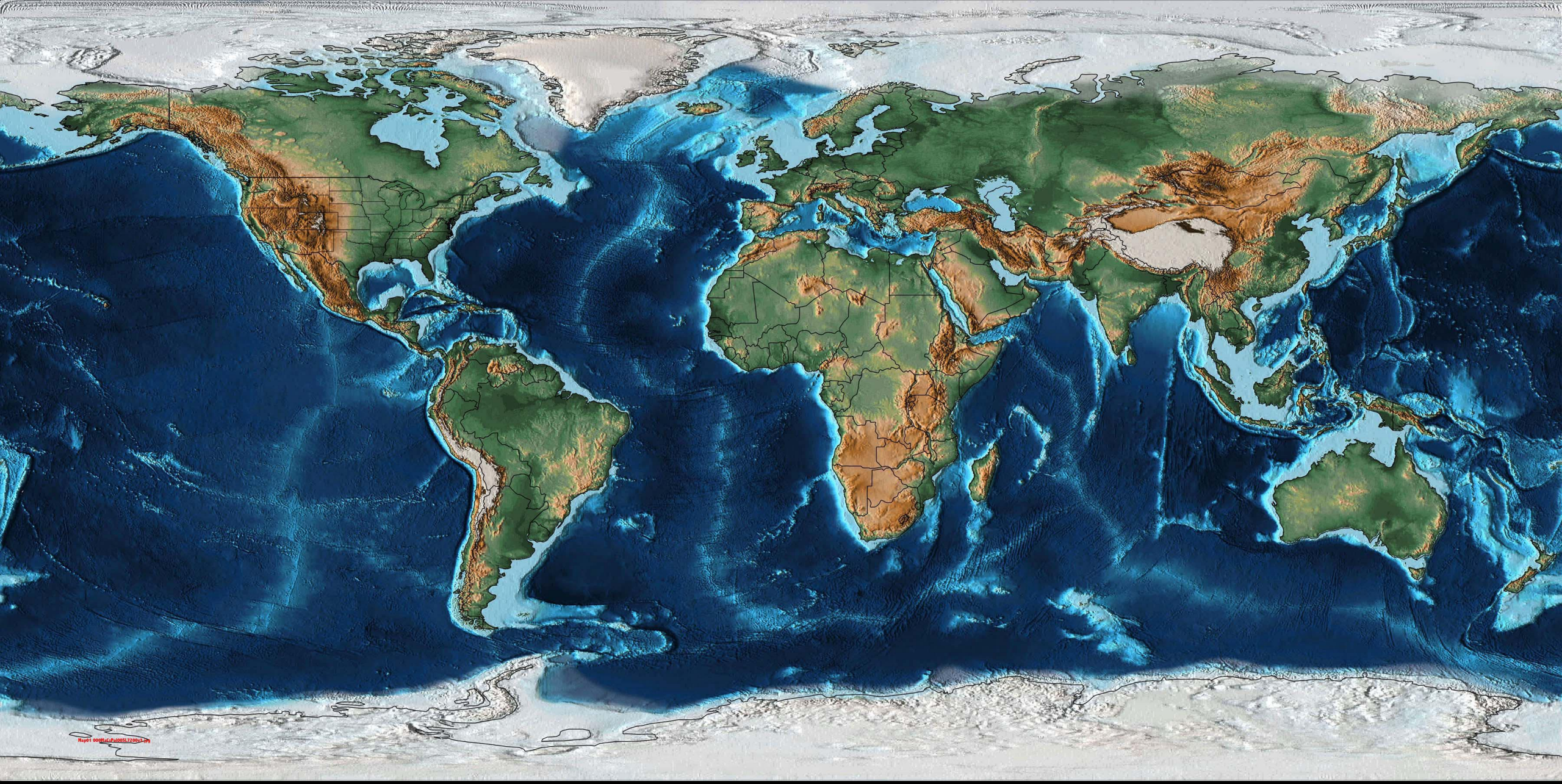
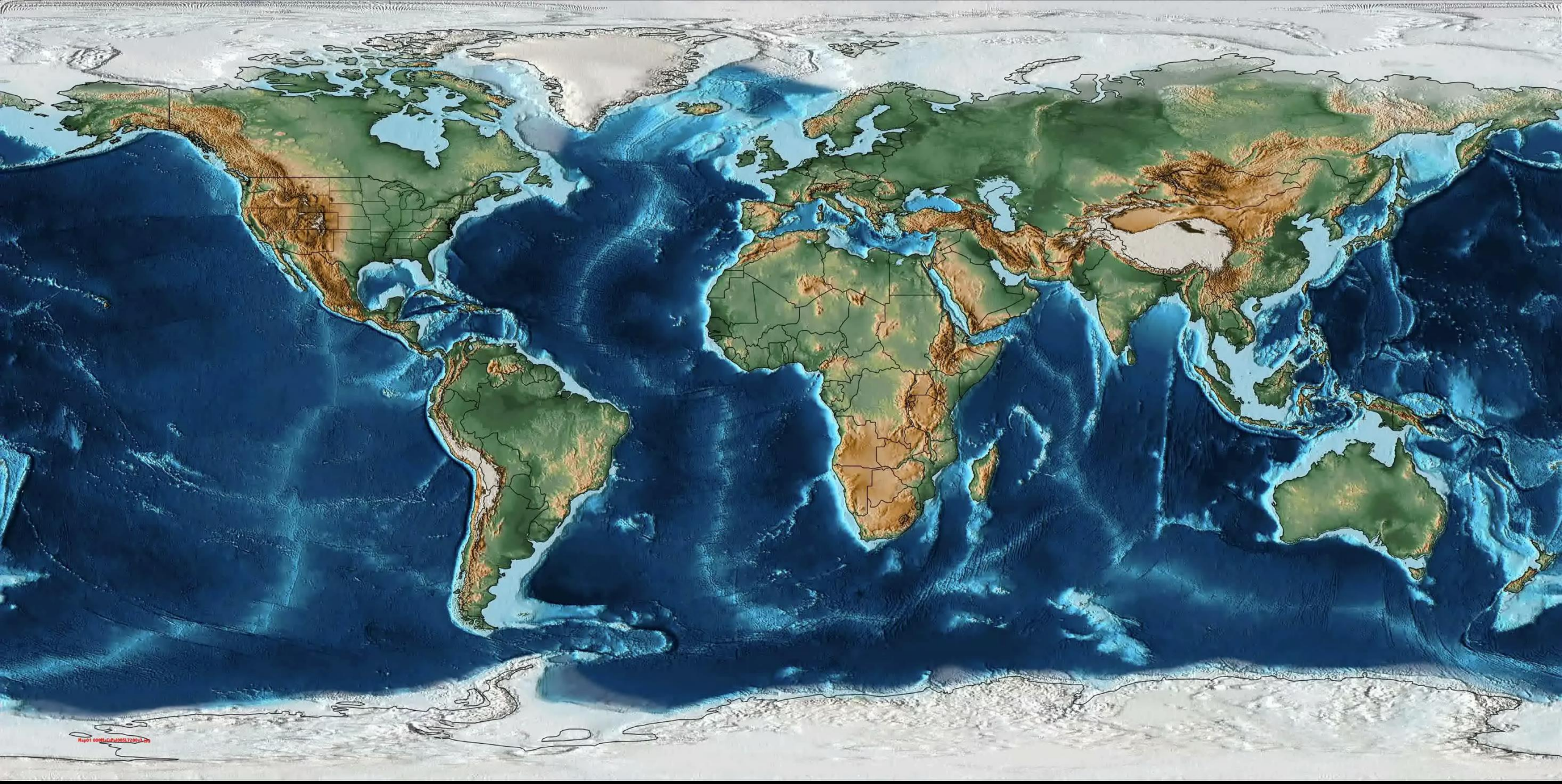
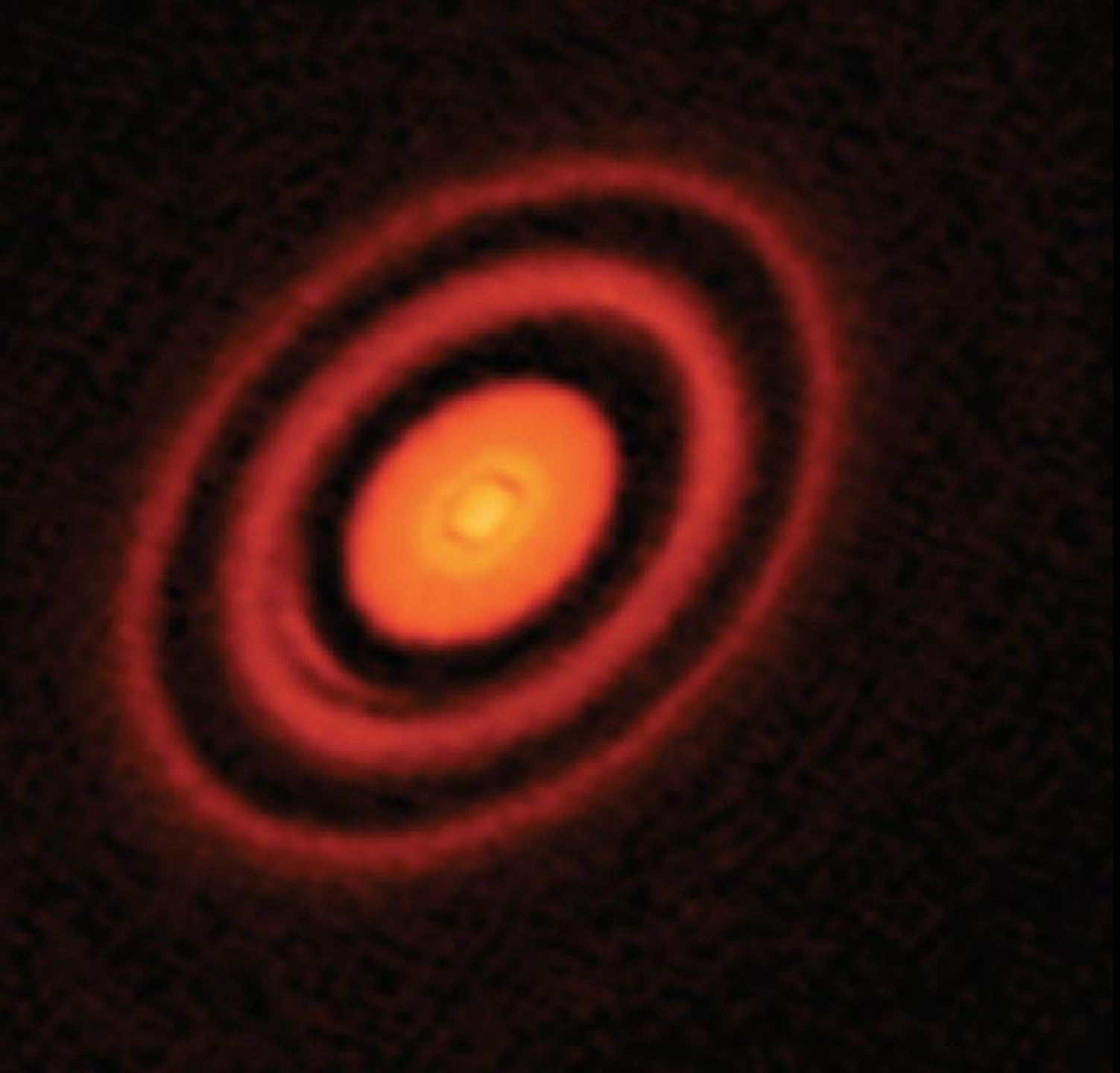
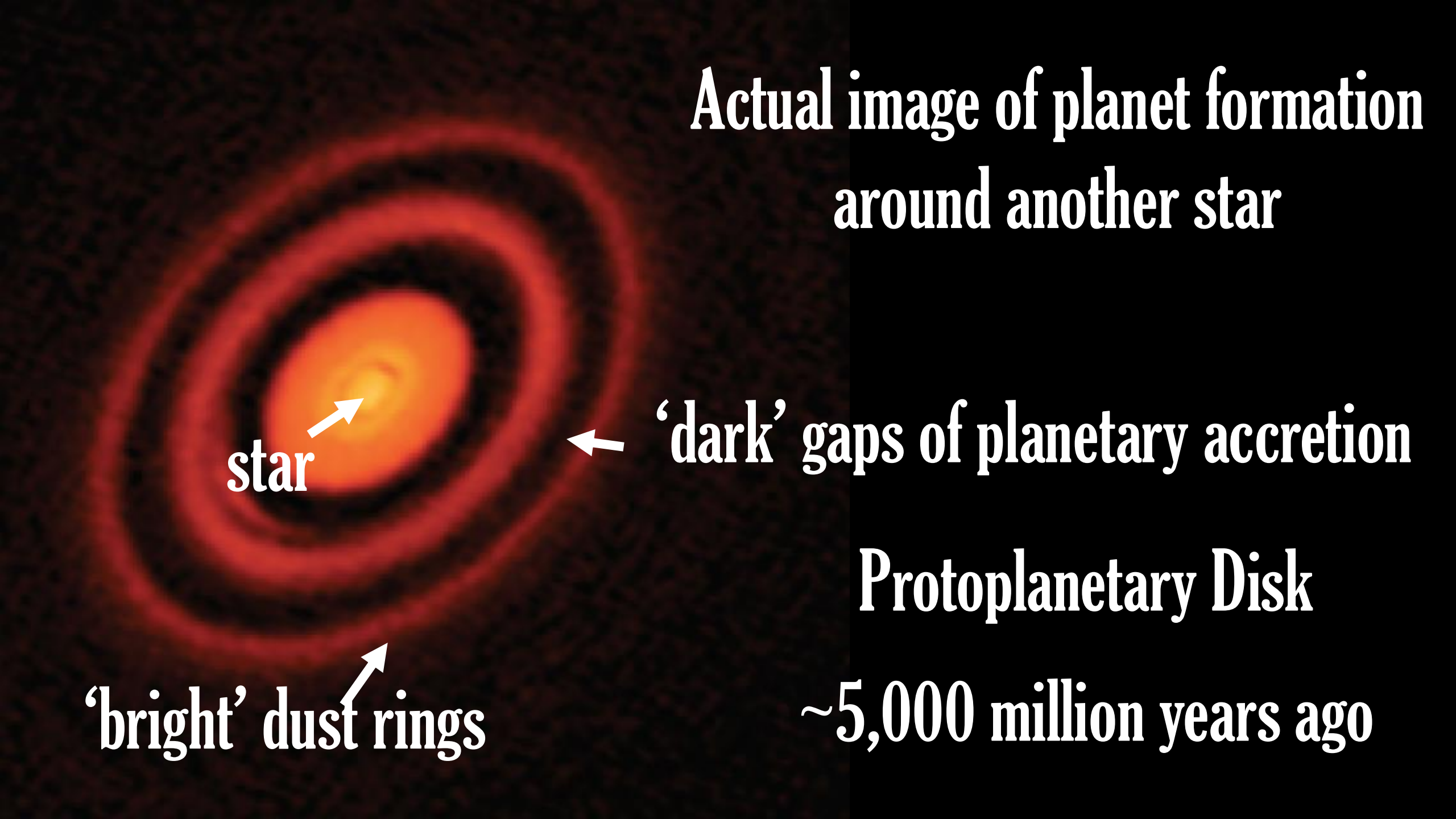
Pound Ridge Land Conservancy



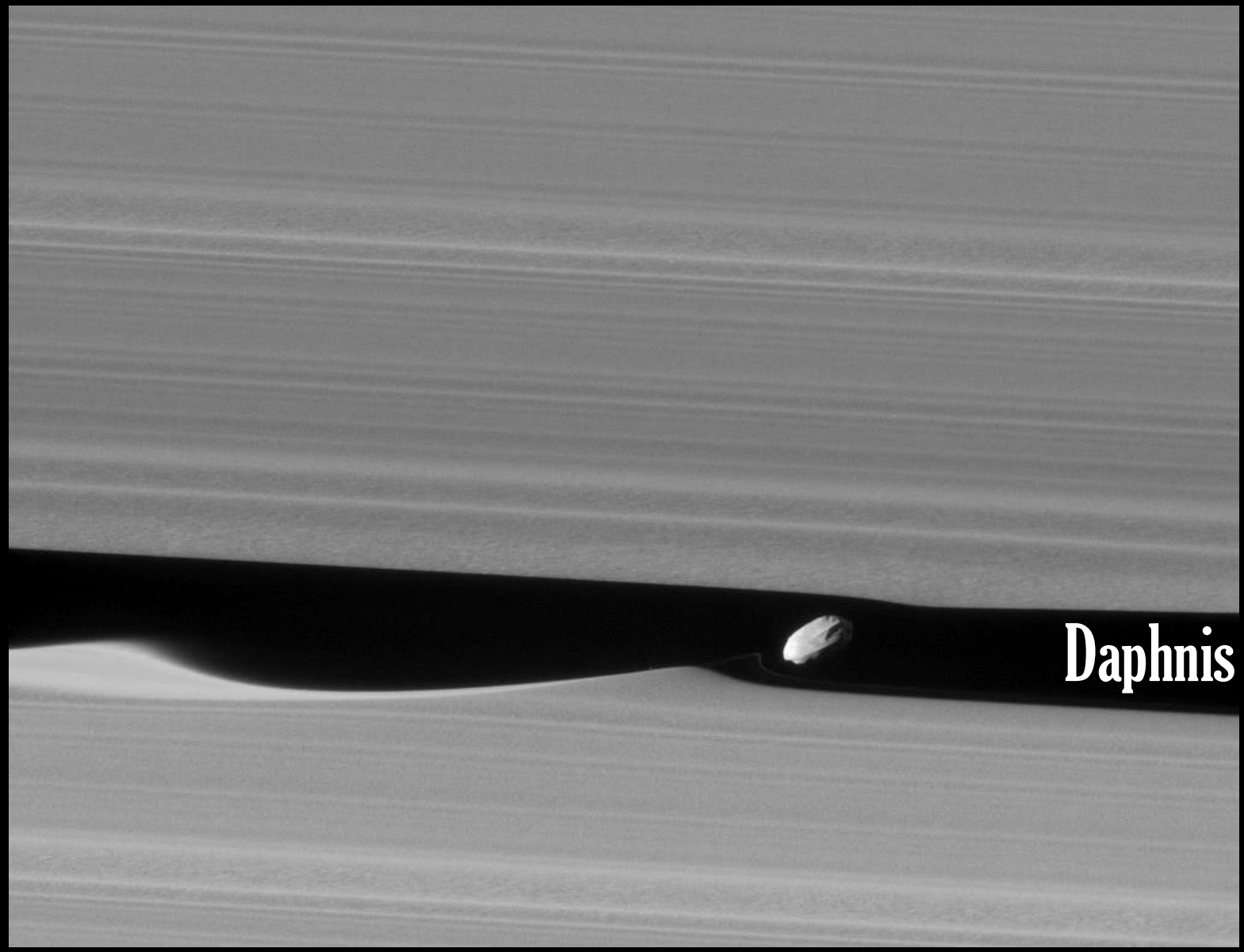




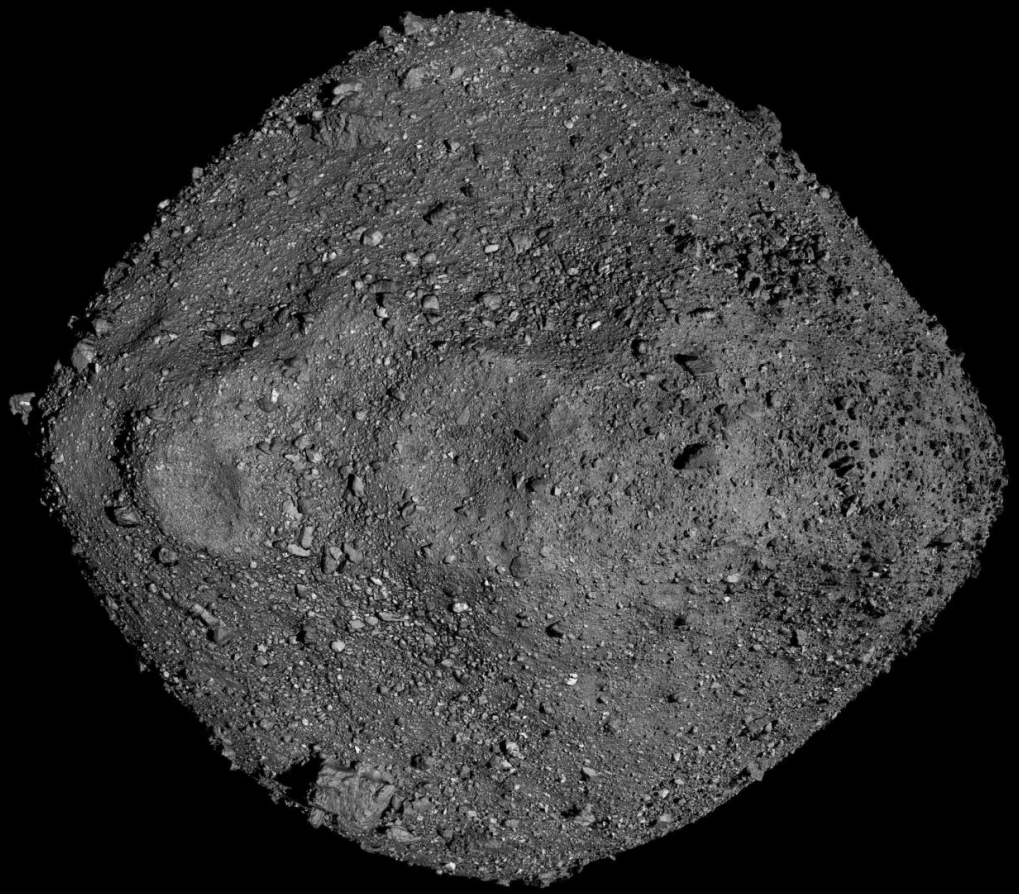

Actual image of planet formation
around another star
star
‘dark’ gaps of planetary accretion
Protoplanetary Disk
‘bright’ dust rings
~5,000 million years ago

Similar structure seen in Saturn's rings

Pan



Bennu



500 m (1640 ft)

Arrokoth

36 km (22 mi)

Ceres

1000 km
(620 mi)

Asteroids accrete more material, become rounded under their own gravity


4,400 million years ago
Hadean Eon

Let's skip ahead:

Simple Life (~3.7 billion years ago)

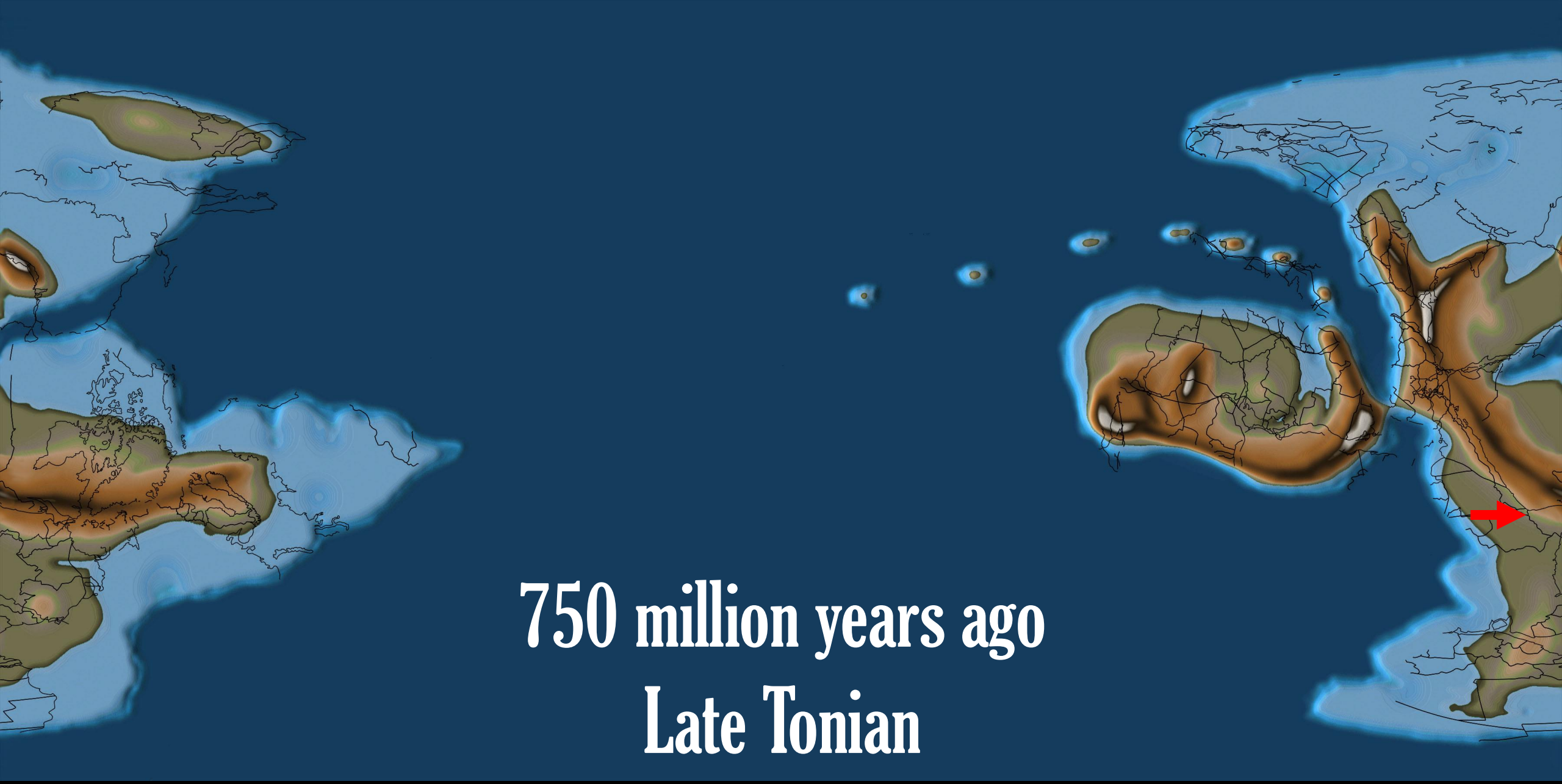
Secondary Atmosphere (~3.5 billion years ago)

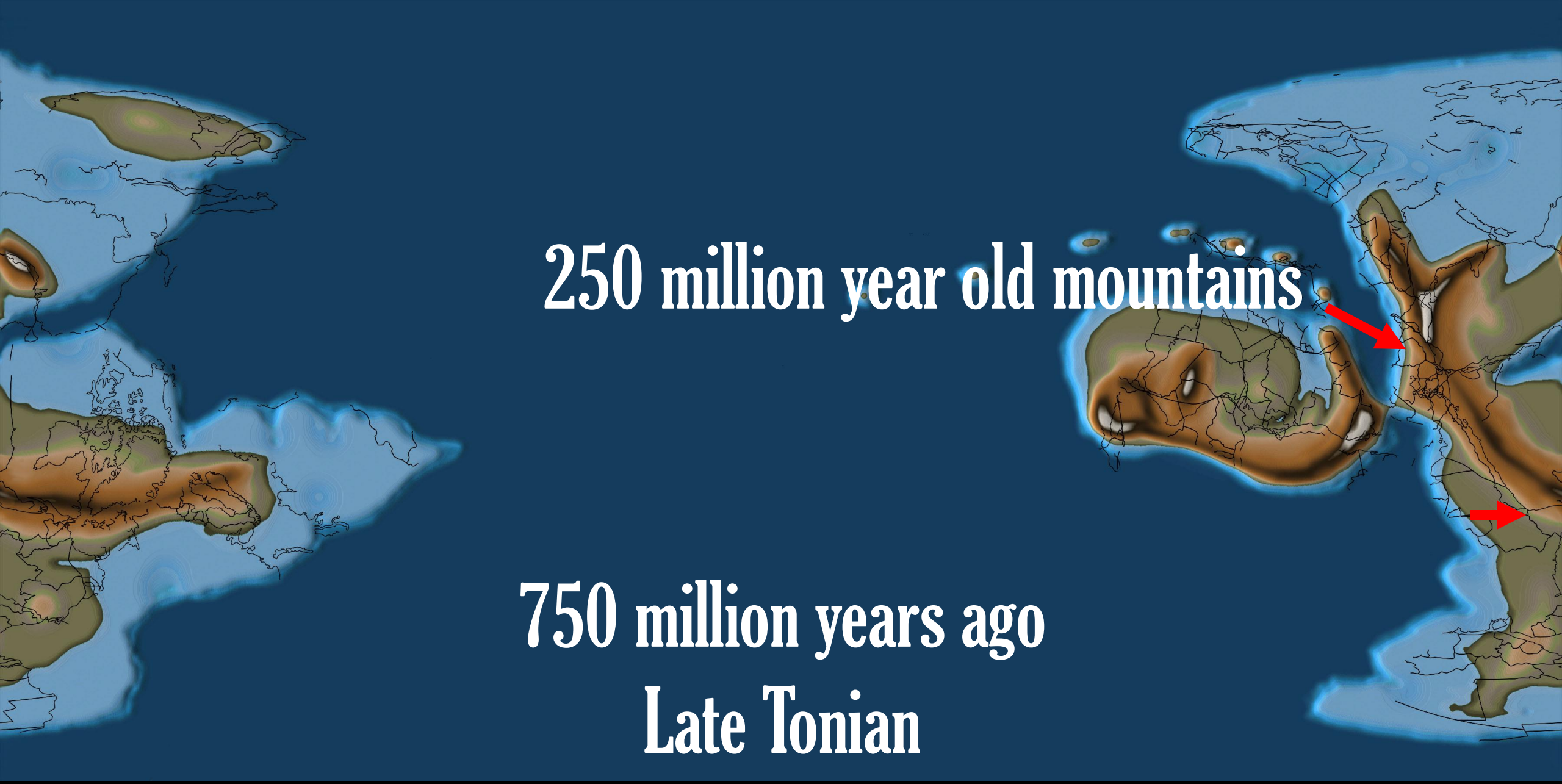
Plate Tectonics (~3.4 billion years ago)

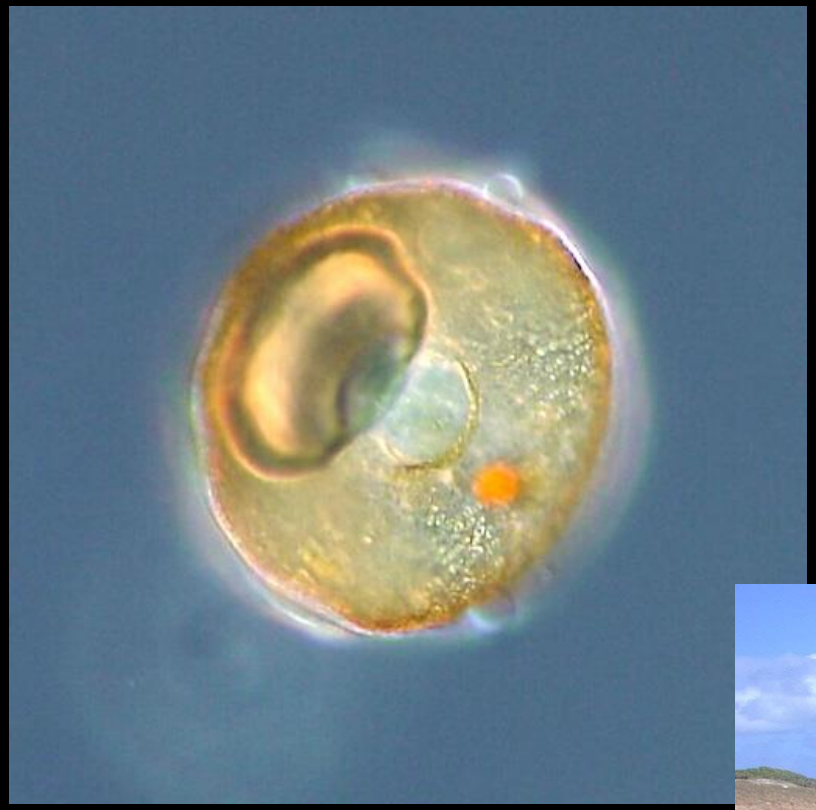
Oxygen (~2.3 billion years ago)

Boring Billion (1.8 billion to 800 million years ago)

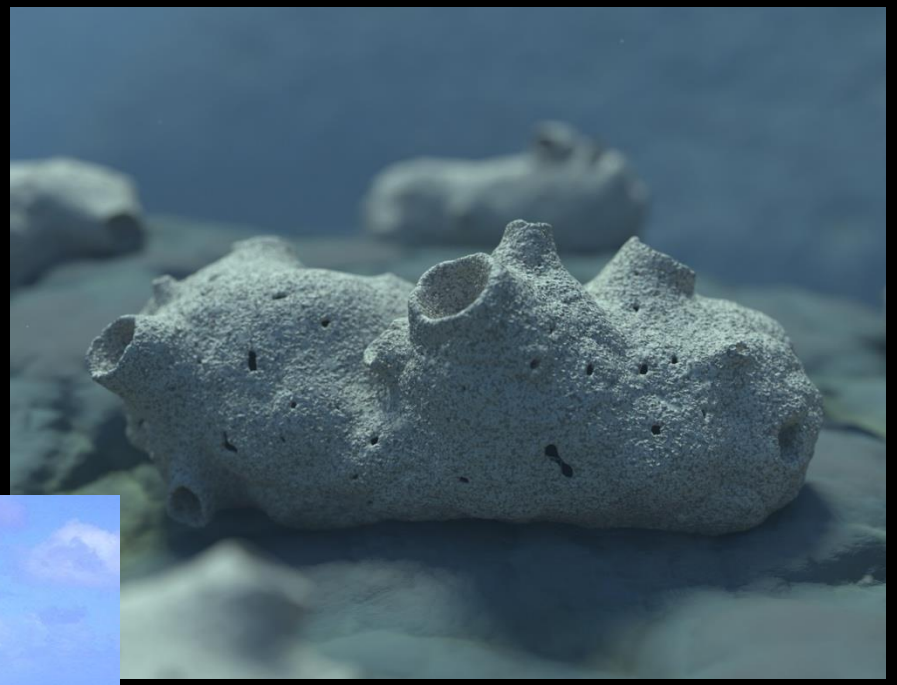
750 million years ago
Late Tonian


750 million years ago
Late Tonian


250 million year old mountains
750 million years ago
Late Tonian



Bacteria, Algae, probably Sponges

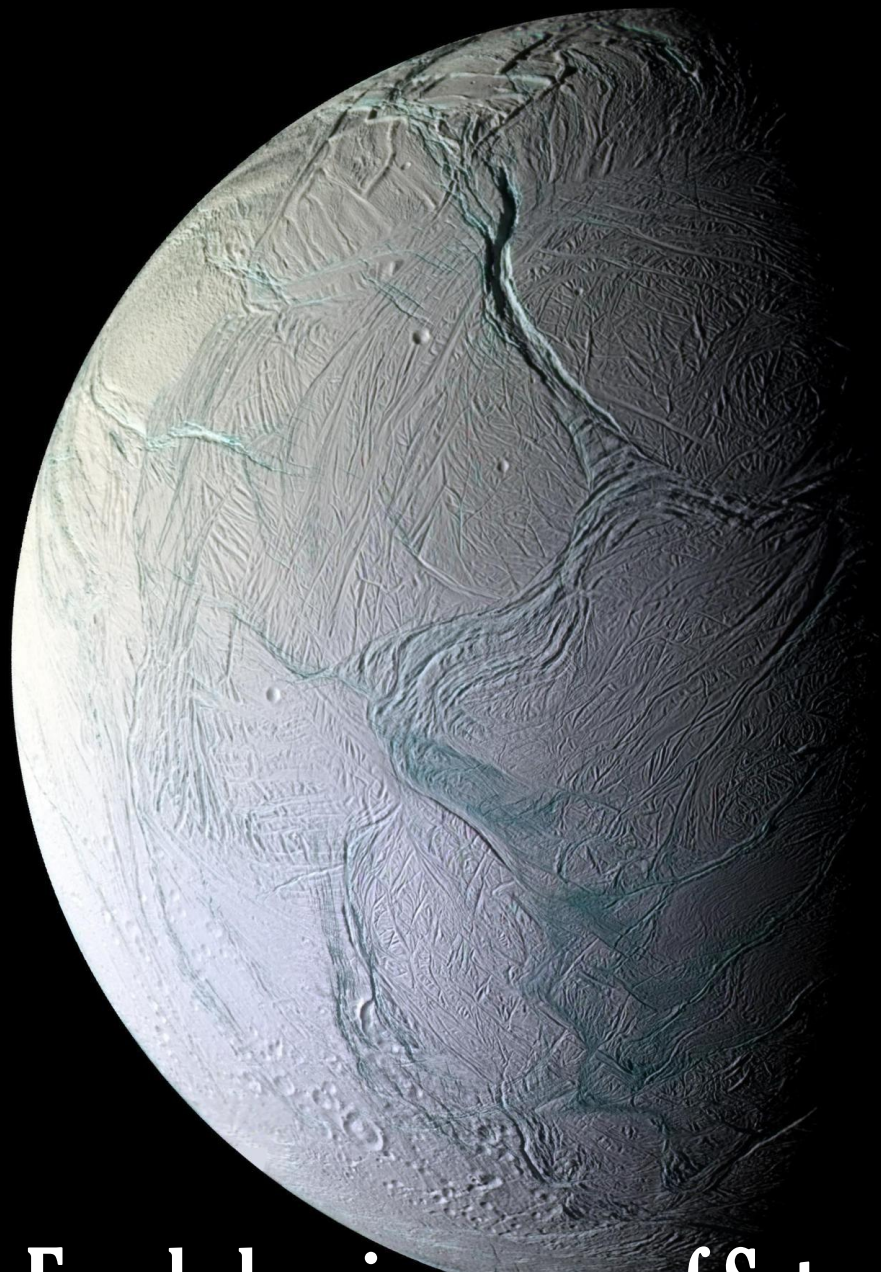


Snowball Earth

Westchester was under ~ 2,000 m of ice

A triggering mechanism cooled Earth, producing enough ice to lead to a positive feedback effect, ultimately covering the entire planet in an ice sheet

Ice covered worlds are not unusual



Enceladus, icy moon of Saturn

Forward 300 million years

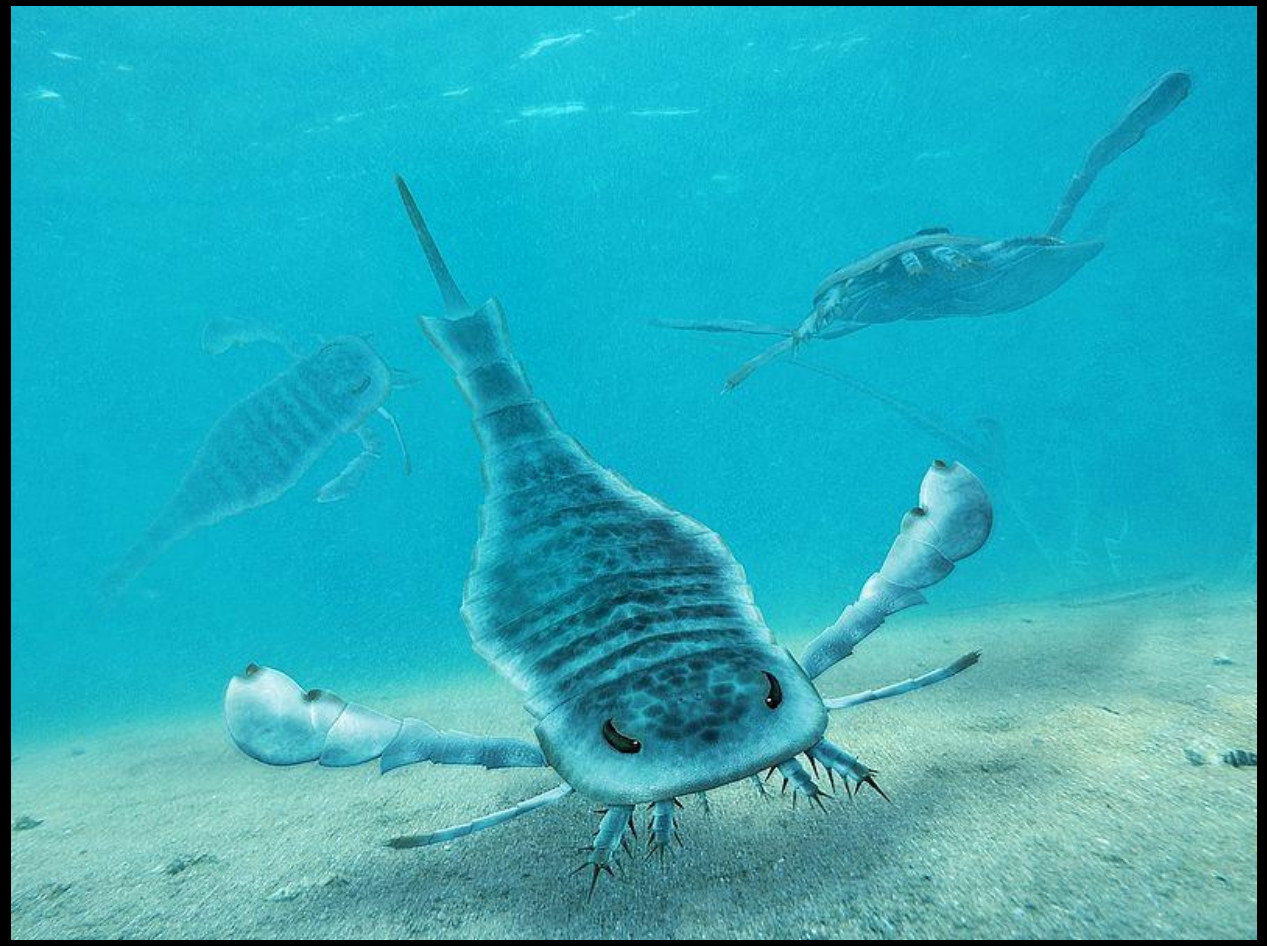
460 million years ago
Late Ordovician

460 million years ago
Westchester was at the bottom of a shallow sea

Eurypterid (Sea Scorpion)

Probably carnivorous

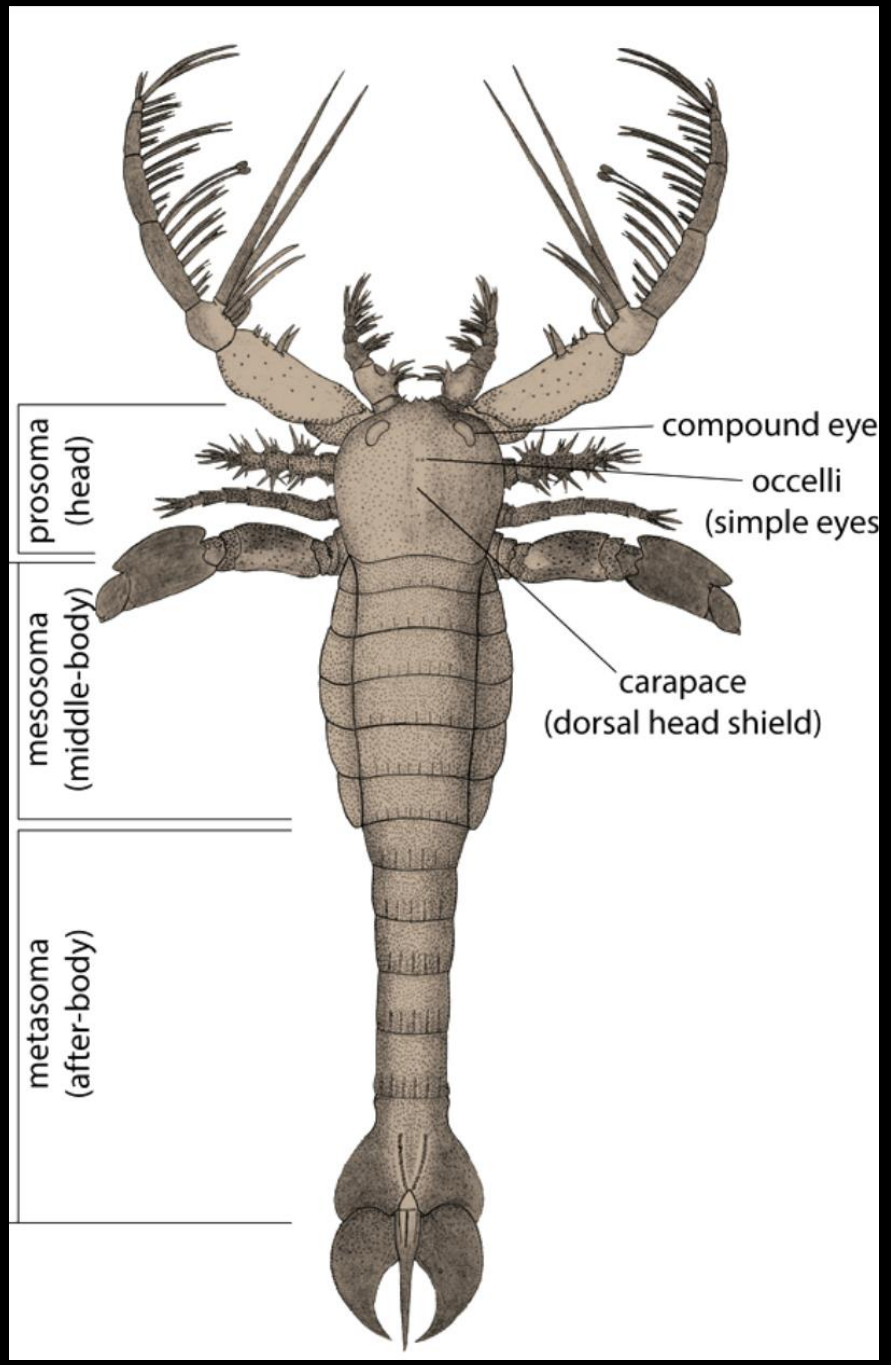
~cm to m



German specimen, but same species as in New York

Eurypterid (Sea Scorpion)

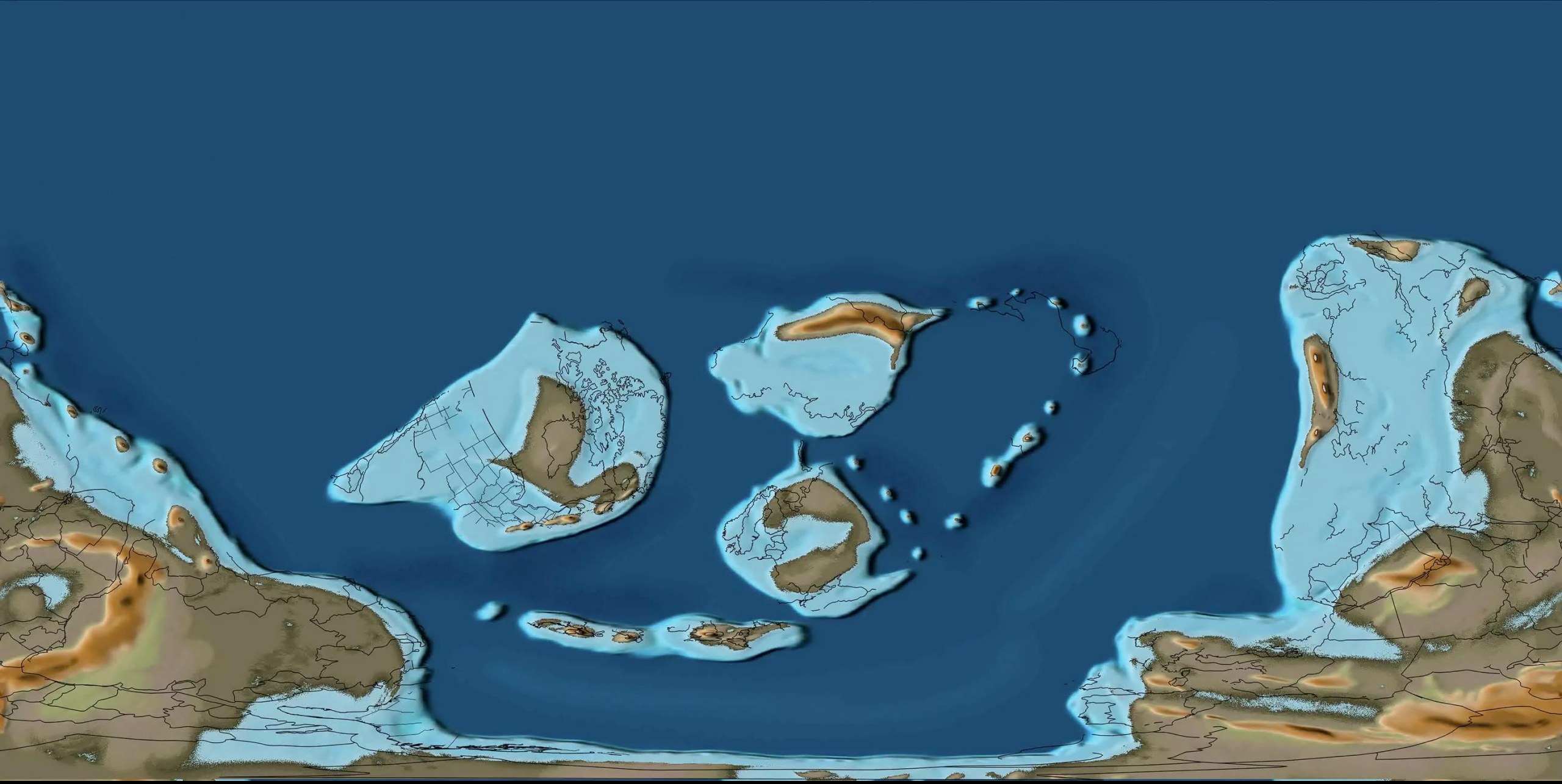
Megalograptus ohioensis holotype



Trilobites

Wide variety of niches: predators, scavengers, filter feeders. Crawling on the seafloor, swimming in open water, and crawling on land.

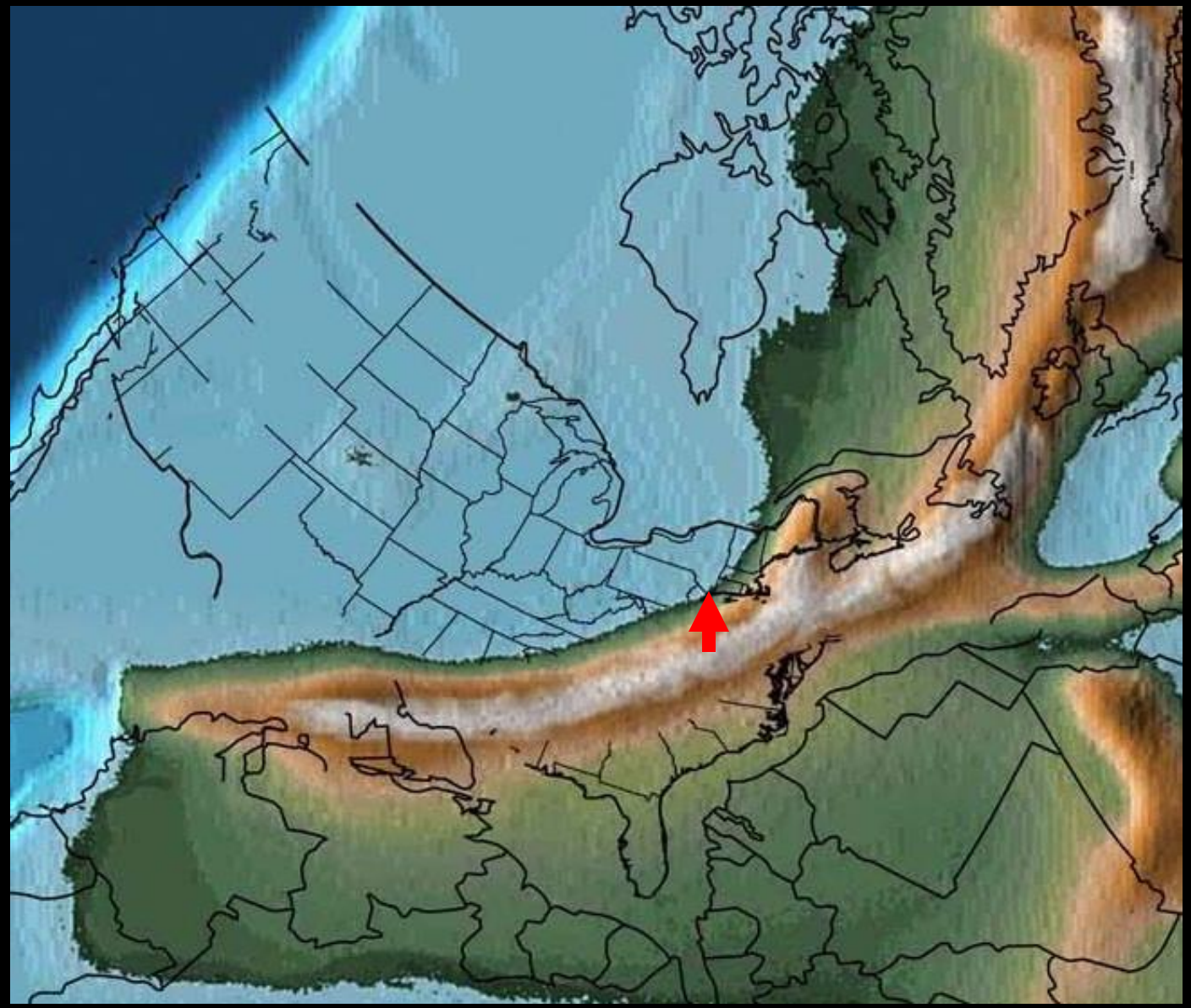
Specimens from Trenton Falls, New York


Forward 100 million years

350 million years ago
Early Carboniferous
‘Acadian Orogeny’

350 million years ago
Early Carboniferous
'Acadian Orogeny'

Westchester had:
Mountains to the East
Seas to the West



To the East:
Acadian orogeny helped to build the Appalachian mountains

To the West: Swampy Forests of *Lepidodendron*

"Scale Trees"

Fossil Grove in Glasgow, Scotland

To the West:
Swampy Forests of *Lepidodendron*

Fossil Grove in Glasgow, Scotland

Forward 100 million years

250 million years ago
Late Permian

250 million years ago
Late Permian

Westchester was part of an arid mountain range

Tibesti Mountains, Central Sahara, Chad

In Siberia: massive volcanic eruptions

Outgassing greenhouse gases

Methanosarcinia

In Siberia: massive volcanic eruptions

Wildfires

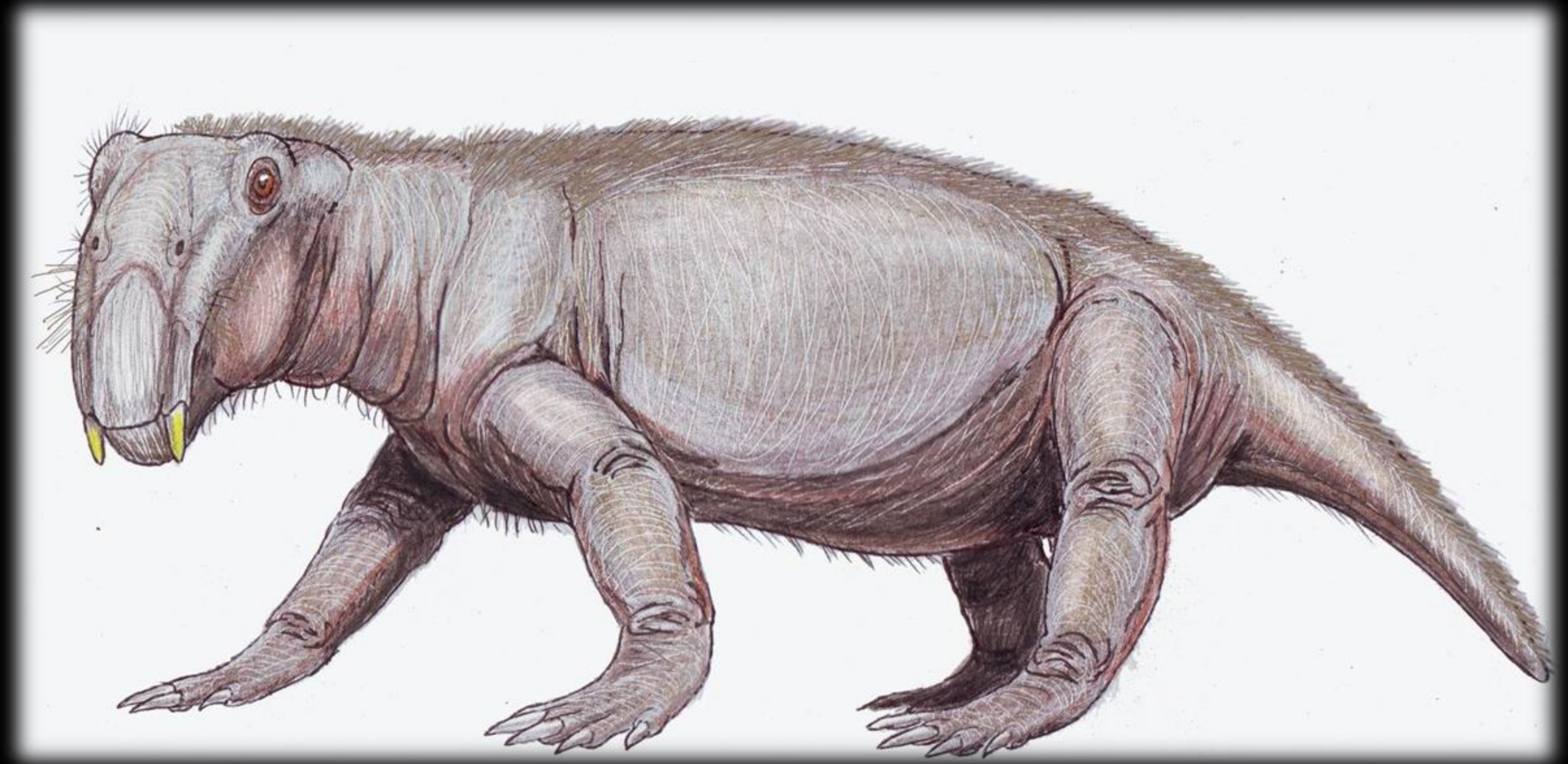
Literally burning coal

Everything Died

*Everything Died

*almost everything… about 90%

Lystrosaurus



Lystrosaurus

Shovel-lizard

50 cm (20 in)

(Other species up to 2 m)

Lystrosaurus

possibly hibernated/burrowed

small and generalized

lack of predators

Forward 75 million years


175 million years ago
Jurassic
Westchester was on the coast
of the proto-Atlantic

Metacomet Ridge

Break-up of Pangaea lead to massive rifting in central Connecticut

Basalt mountains eroded to sand

Hanging Hills, Meriden, CT

Dinosaur State Park, CT

Dinosaur State Park, CT

Dilophosaurus

Dilophosaurus

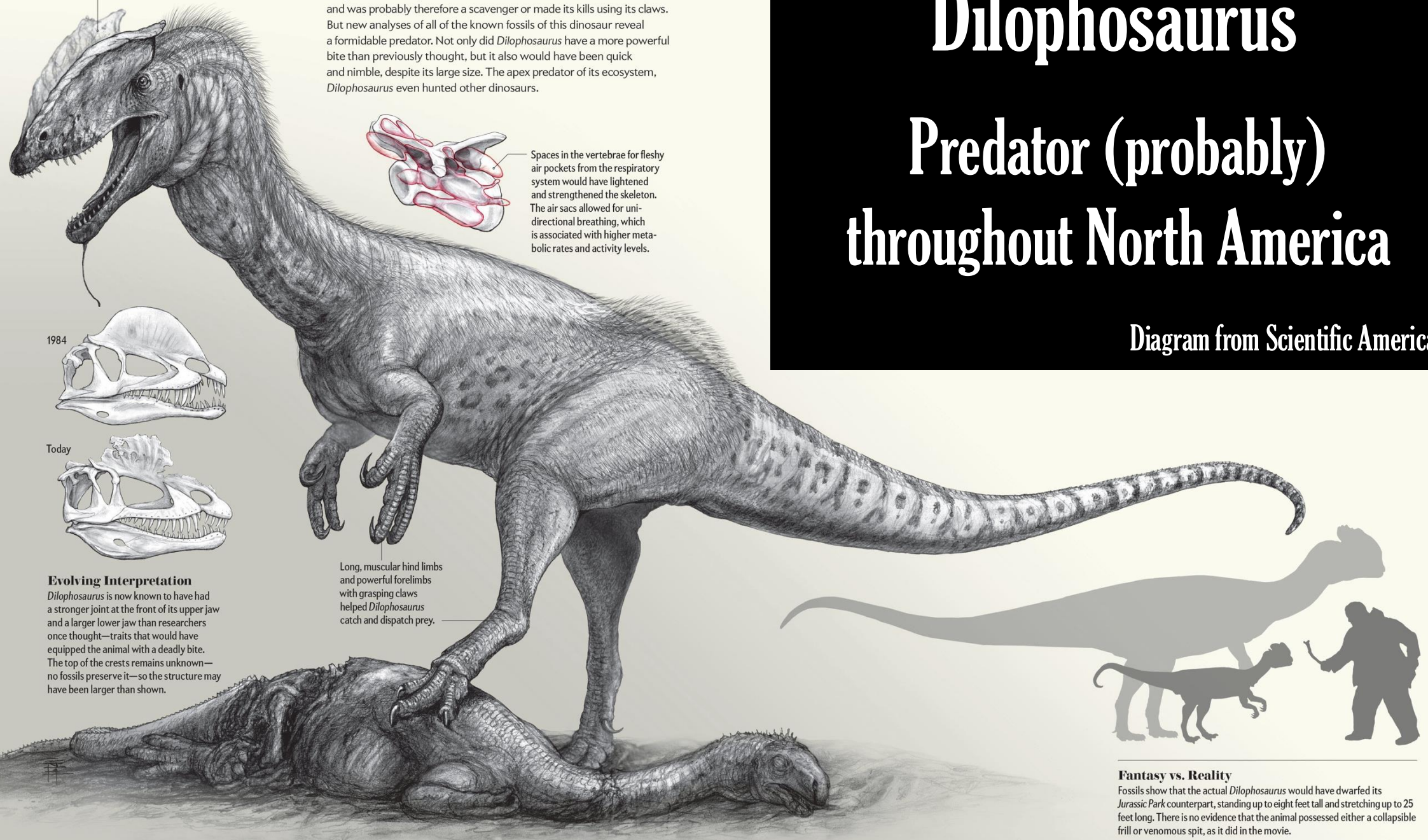
Predator (probably) throughout North America

Diagram from Scientific American

Portrait of a Predator

Early studies of *Dilophosaurus* concluded that the animal had weak jaws and was probably therefore a scavenger or made its kills using its claws. But new analyses of all of the known fossils of this dinosaur reveal a formidable predator. Not only did *Dilophosaurus* have a more powerful bite than previously thought, but it also would have been quick and nimble, despite its large size. The apex predator of its ecosystem, *Dilophosaurus* even hunted other dinosaurs.

Dual crests had air sacs and were probably sheathed in keratin. The crests may have helped members of this species identify one another or attract mates.



Spaces in the vertebrae for fleshy air pockets from the respiratory system would have lightened and strengthened the skeleton. The air sacs allowed for unidirectional breathing, which is associated with higher metabolic rates and activity levels.

1984

Today

Evolving Interpretation

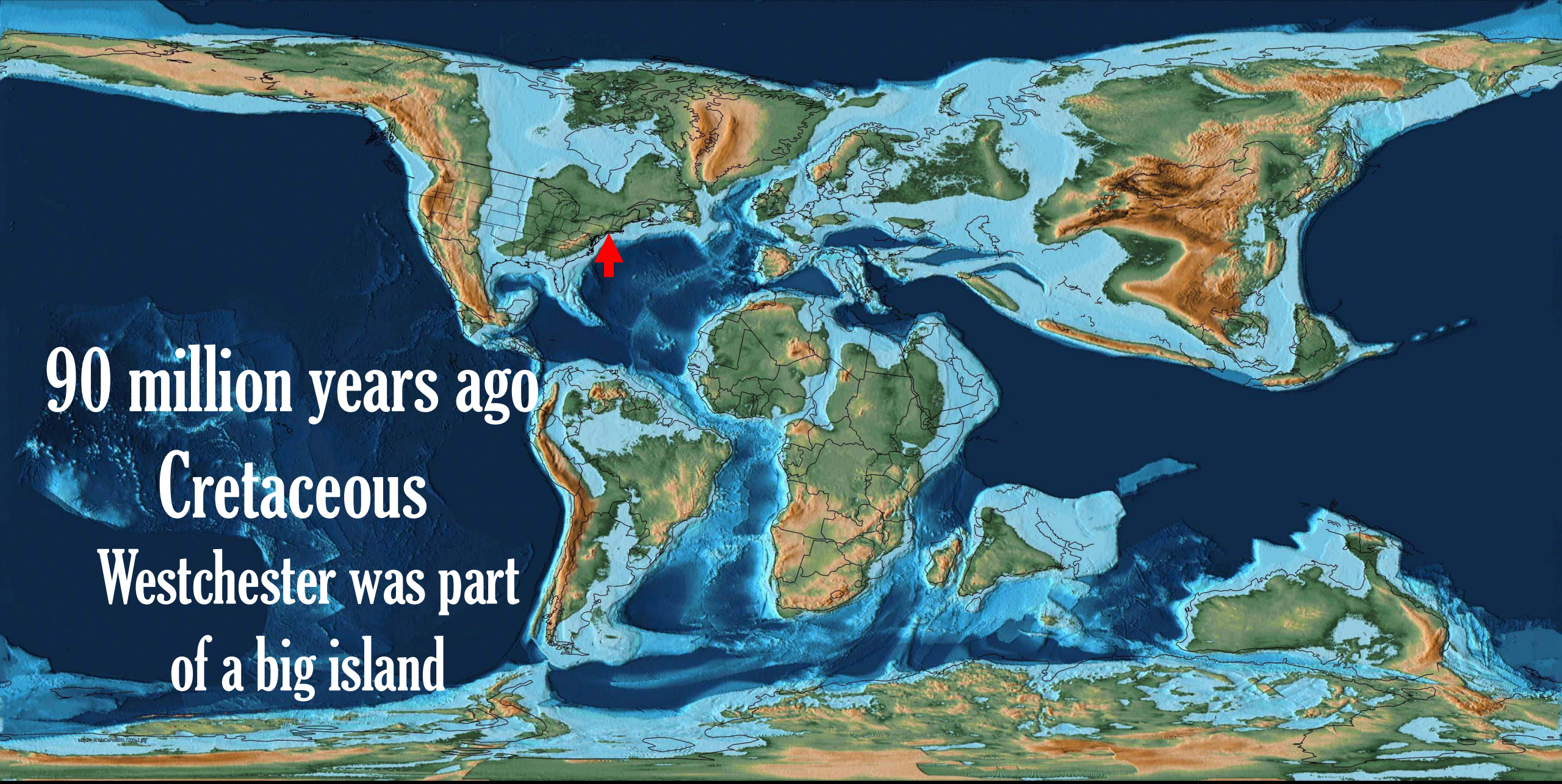
Dilophosaurus is now known to have had a stronger joint at the front of its upper jaw and a larger lower jaw than researchers once thought—traits that would have equipped the animal with a deadly bite. The top of the crests remains unknown—no fossils preserve it—so the structure may have been larger than shown.

Long, muscular hind limbs and powerful forelimbs with grasping claws helped *Dilophosaurus* catch and dispatch prey.

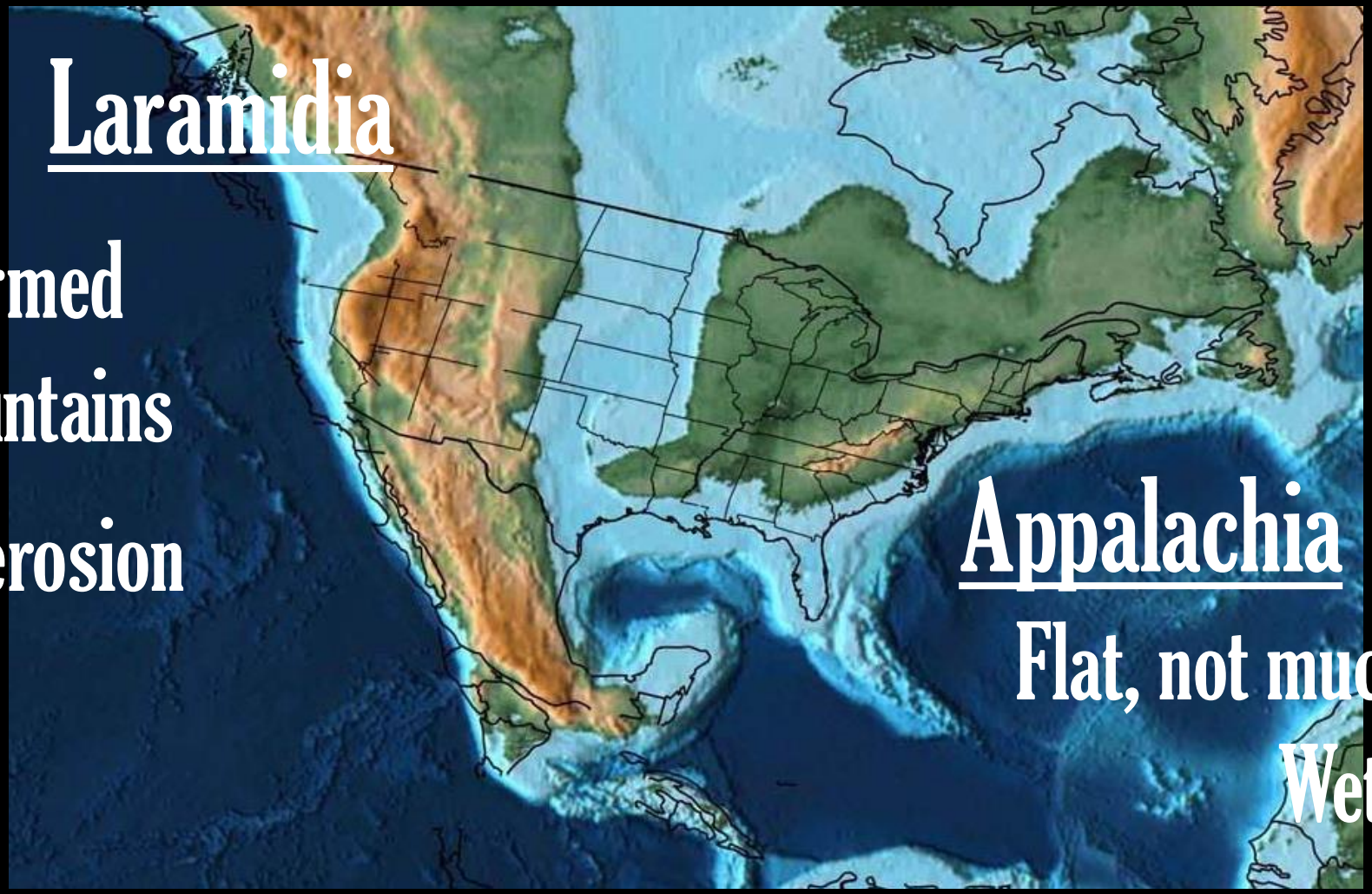
Fantasy vs. Reality

Fossils show that the actual *Dilophosaurus* would have dwarfed its *Jurassic Park* counterpart, standing up to eight feet tall and stretching up to 25 feet long. There is no evidence that the animal possessed either a collapsible frill or venomous spit, as it did in the movie.

Forward 35 million years


90 million years ago
Cretaceous
Westchester was part
of a big island

Two islands of North America



Newly formed

Rocky Mountains

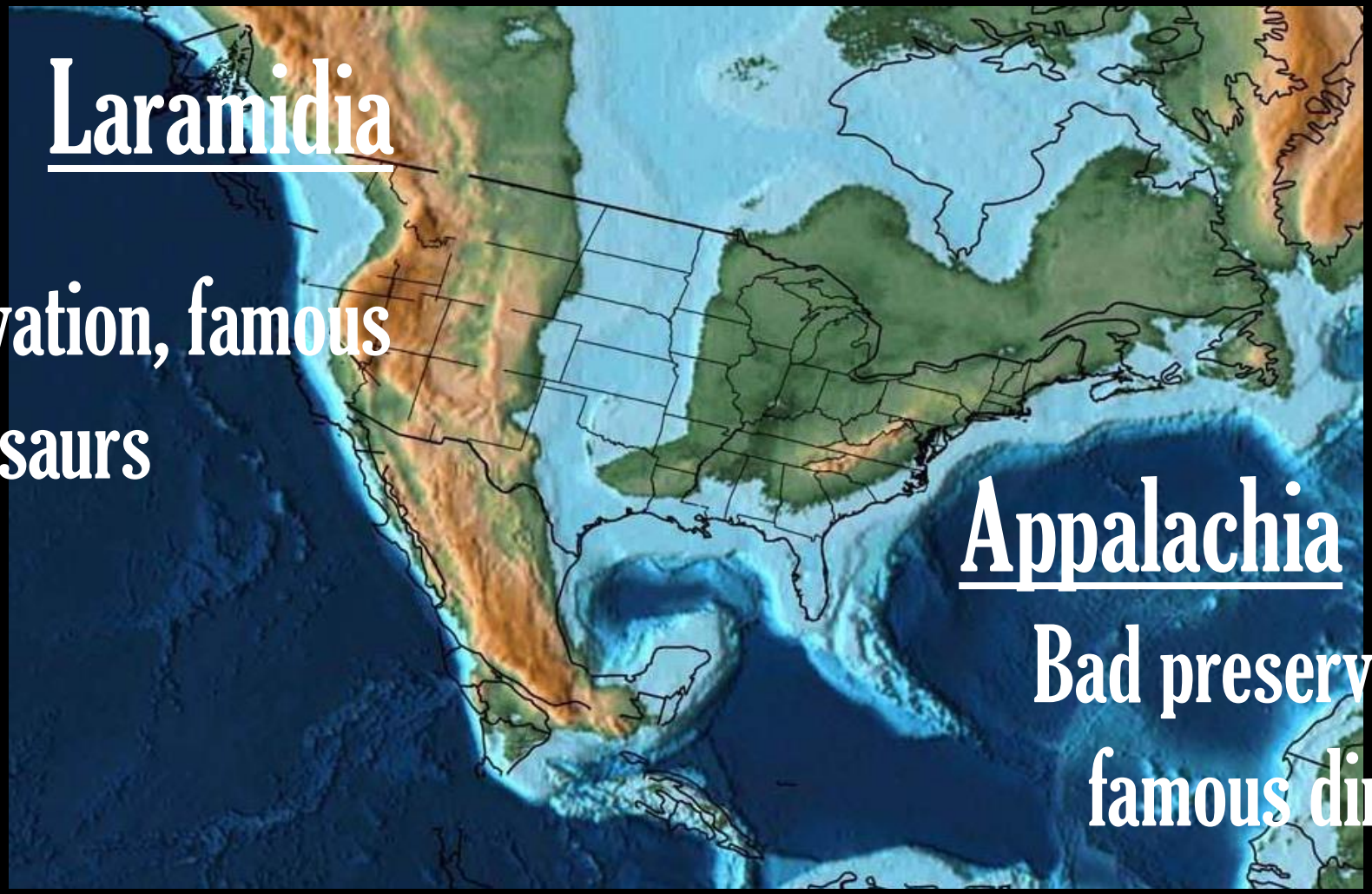
Persistent erosion

Arid

Flat, not much erosion

Wet

Two islands of North America



Good preservation, famous dinosaurs

Bad preservation, not famous dinosaurs

Appalachiosurus

Therapod

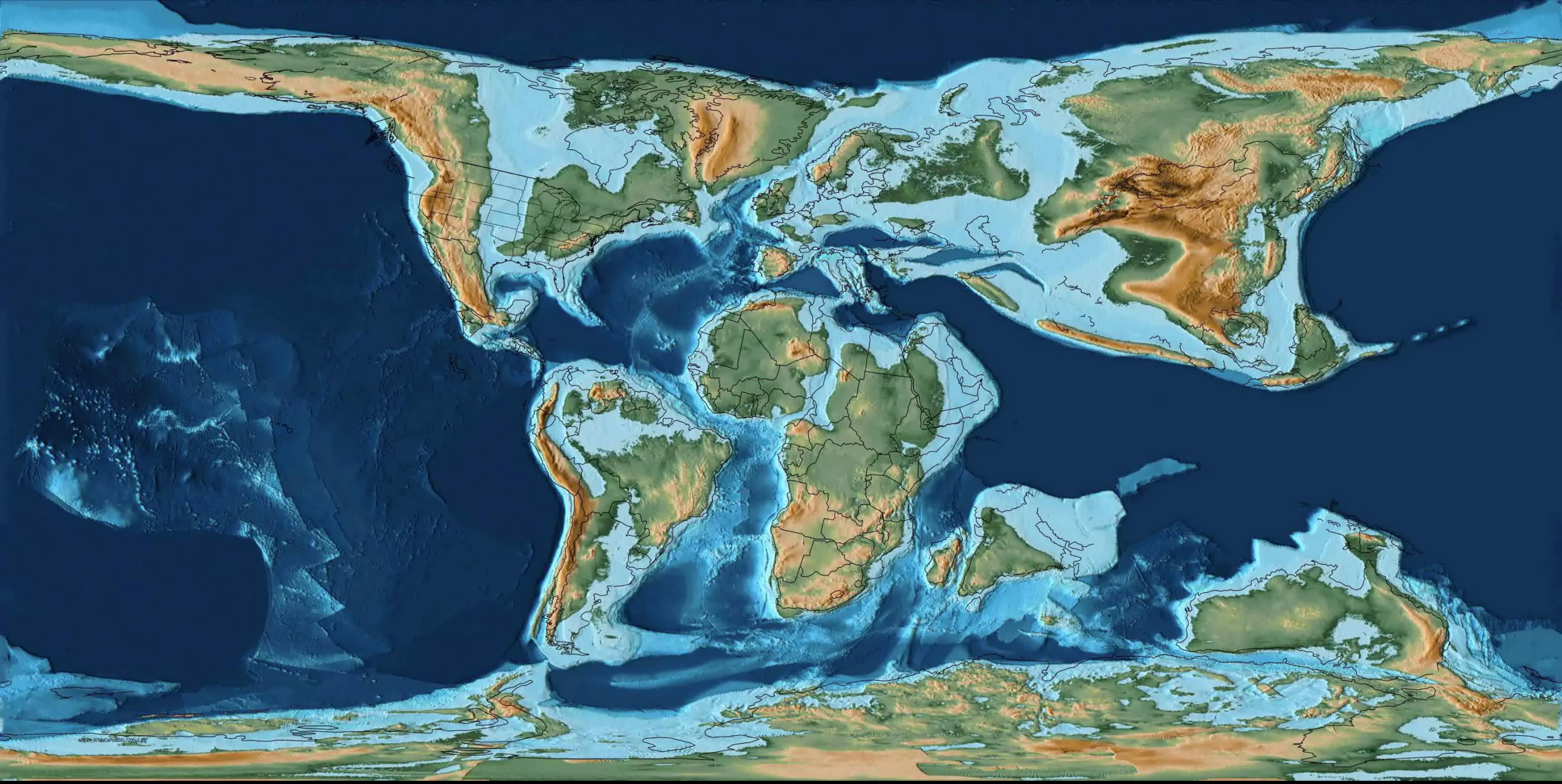
(like a small *Tyrannosaurus*)

Hadrosaurus

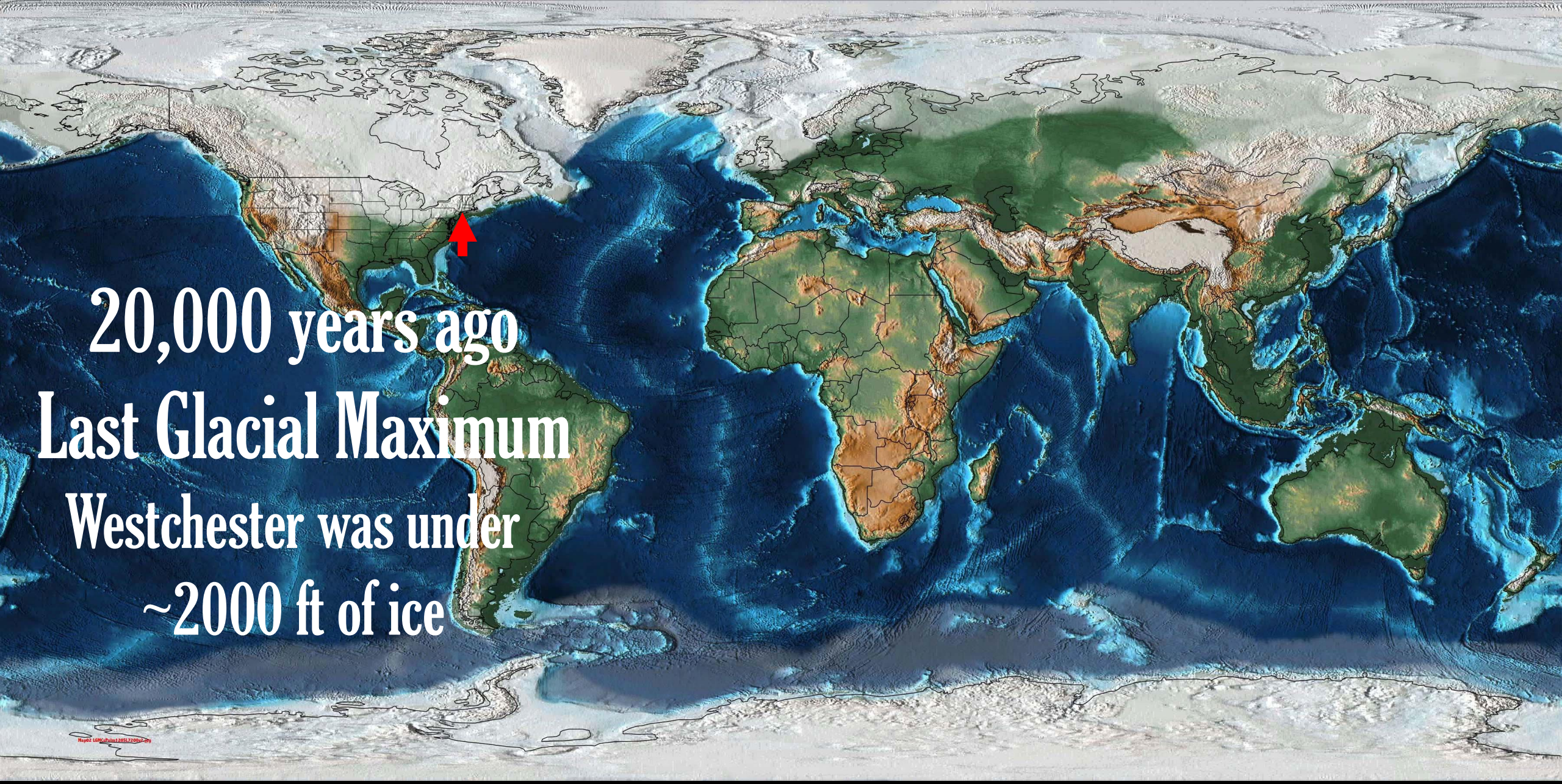
‘Duck-billed dinosaur’

Alphadon
Early mammal

Apalone-like Soft shelled turtle

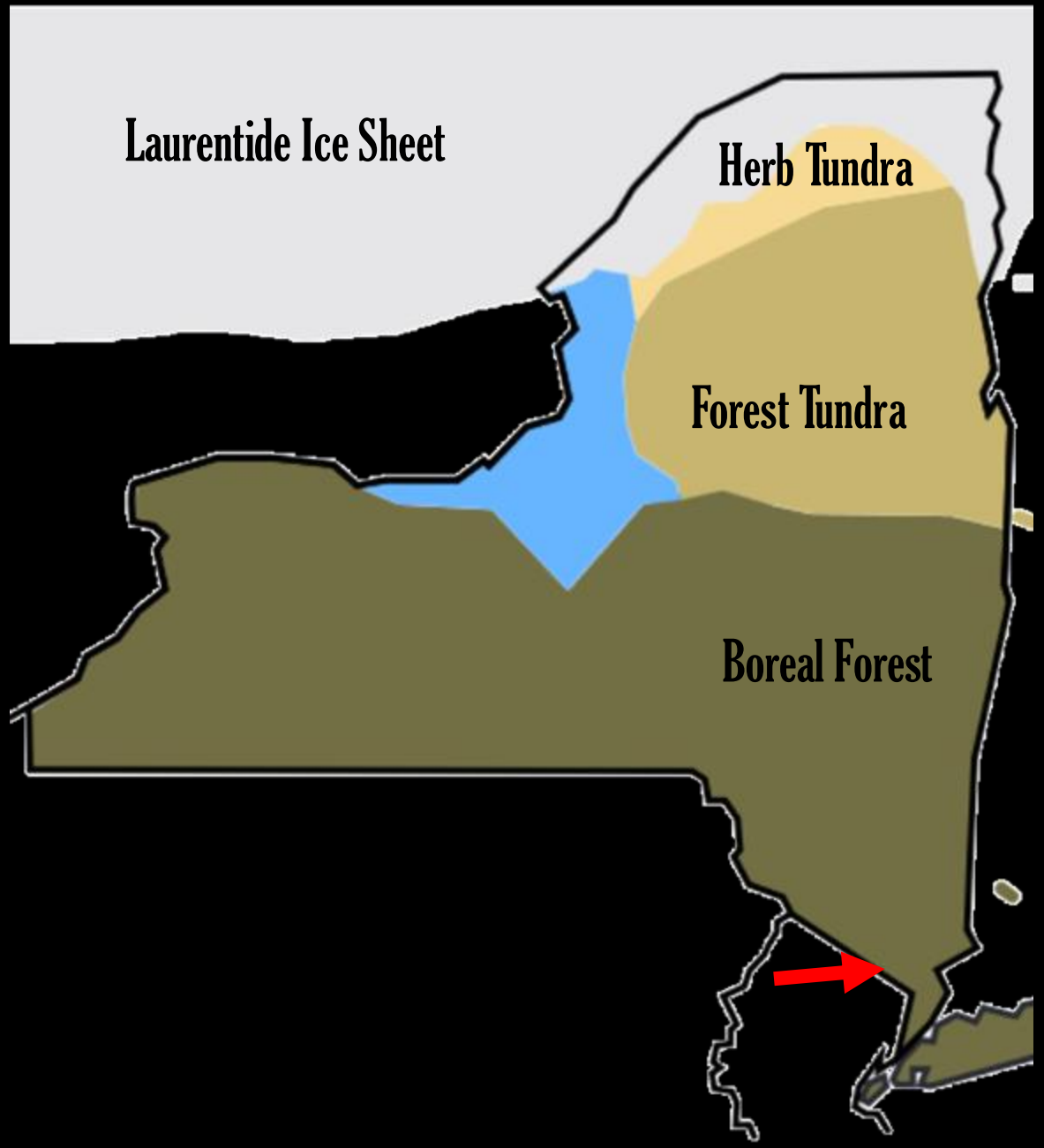


Forward 90 million years


20,000 years ago
Last Glacial Maximum
Westchester was under
~2000 ft of ice

14,000 years ago

As the Laurentide Ice Sheet retreated, Westchester was a Boreal Forest.

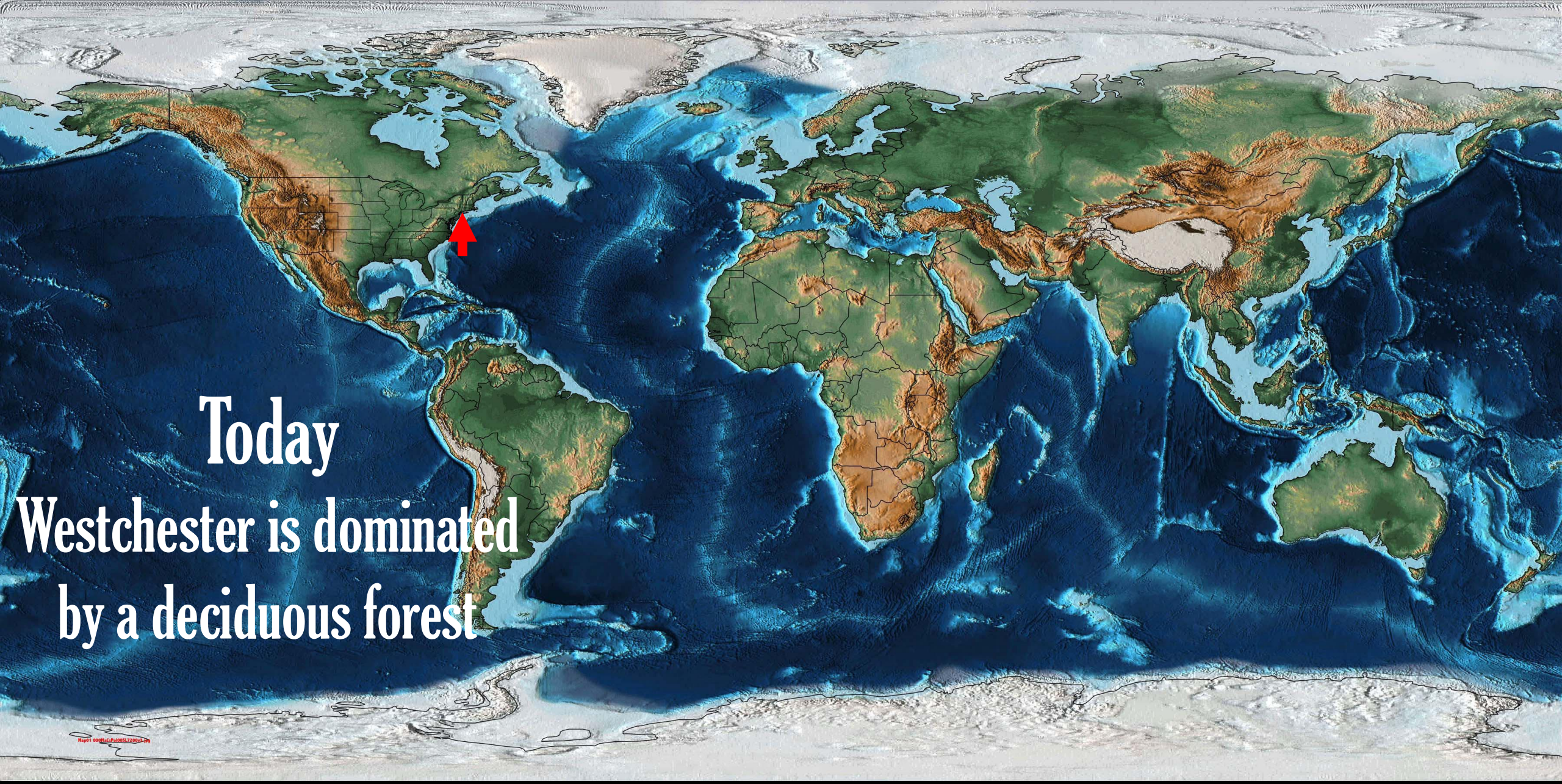


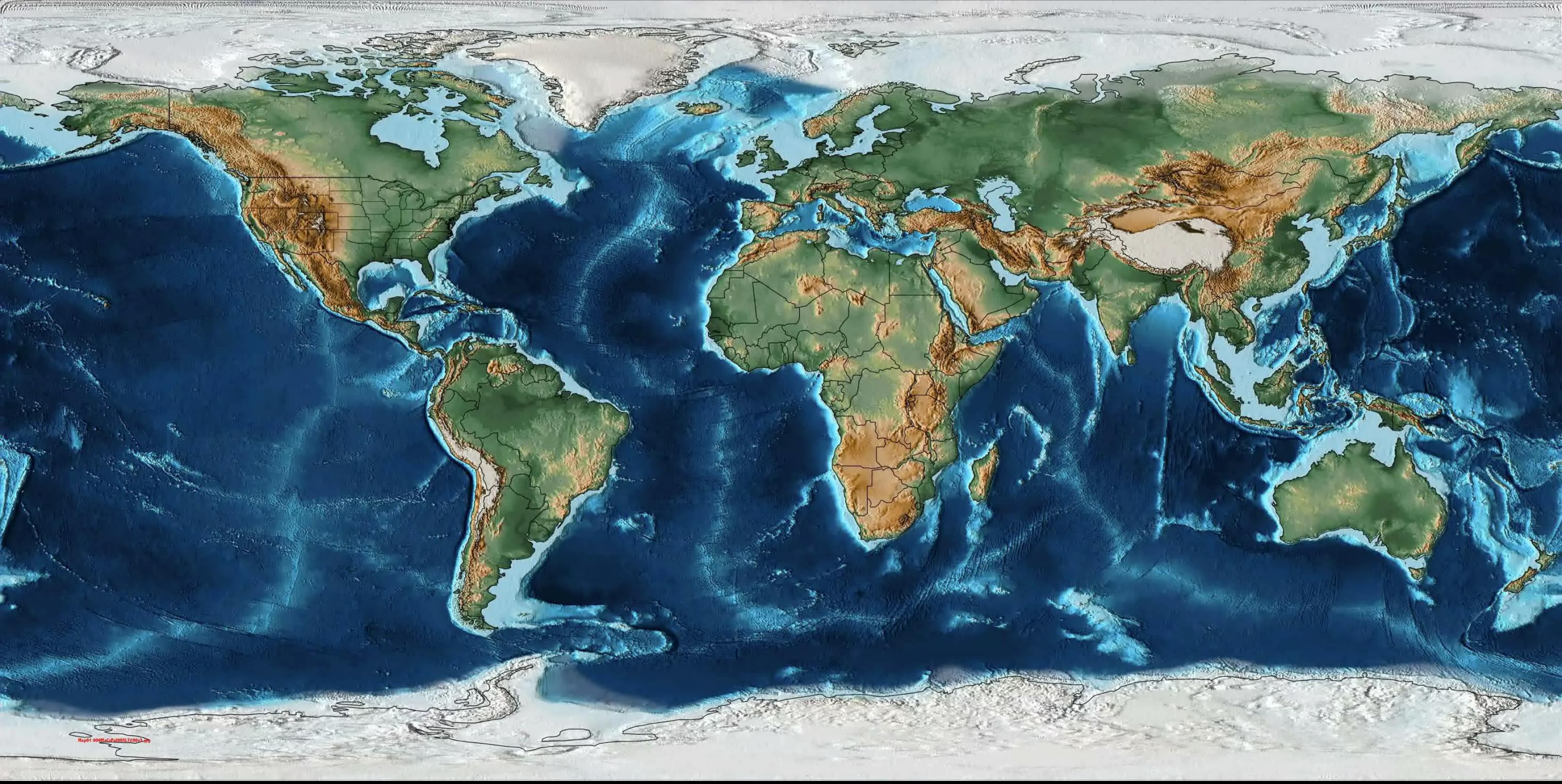
"Ice Age Mammals Colonize New York",
New York State Museum

Caribou

Also mammoths, ground sloths, more!

Cohoes Mastodon, New York State Museum


Today
Westchester is dominated
by a deciduous forest



Questions?

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