

Lifetime Learning Institute, 2019



19FA25

THE DAY THE DINOSAURS DIED

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TRUTH BE TOLD

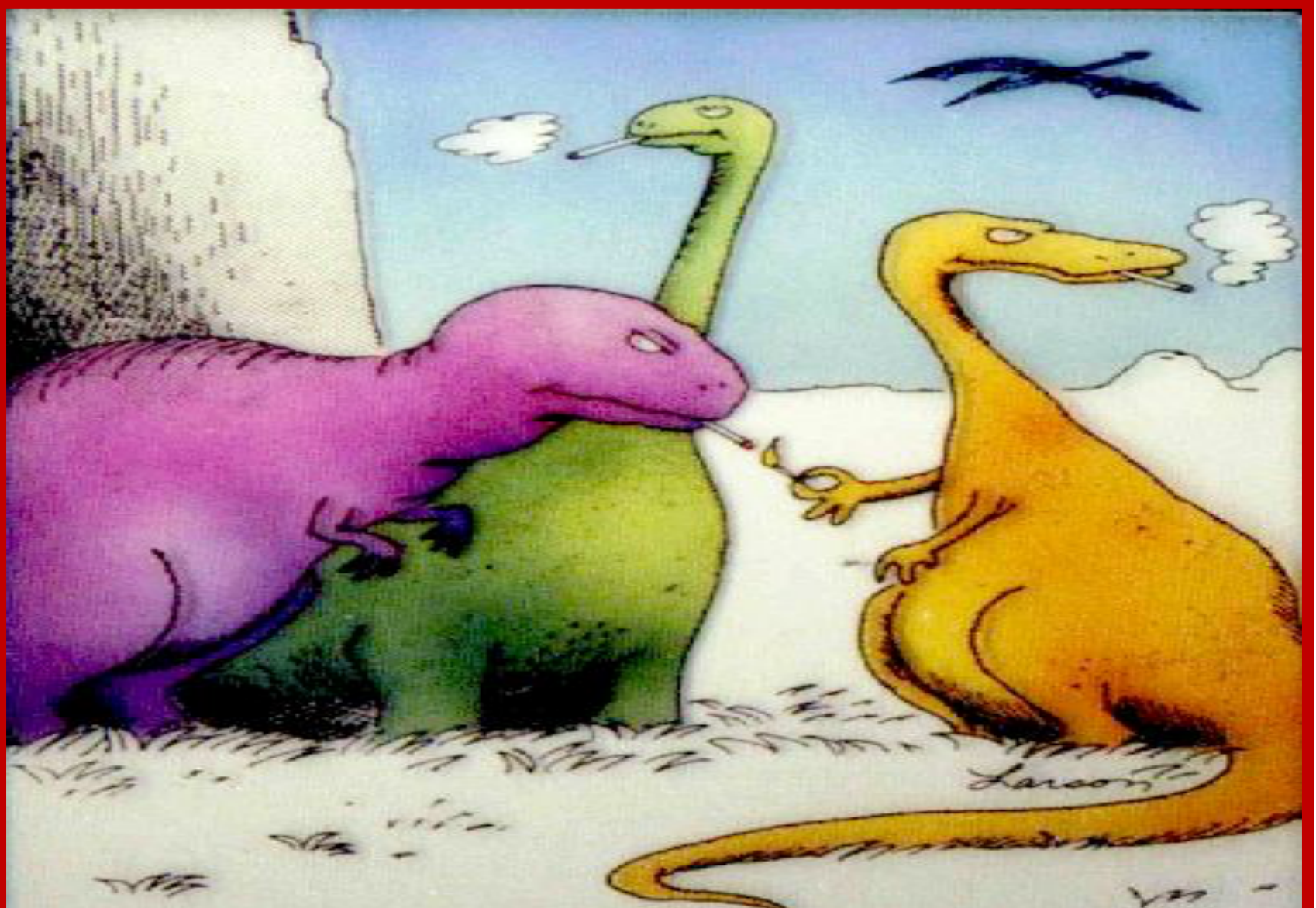
THE TITLE IS all hyperbole!

WHAT IT SHOULD BE IS:

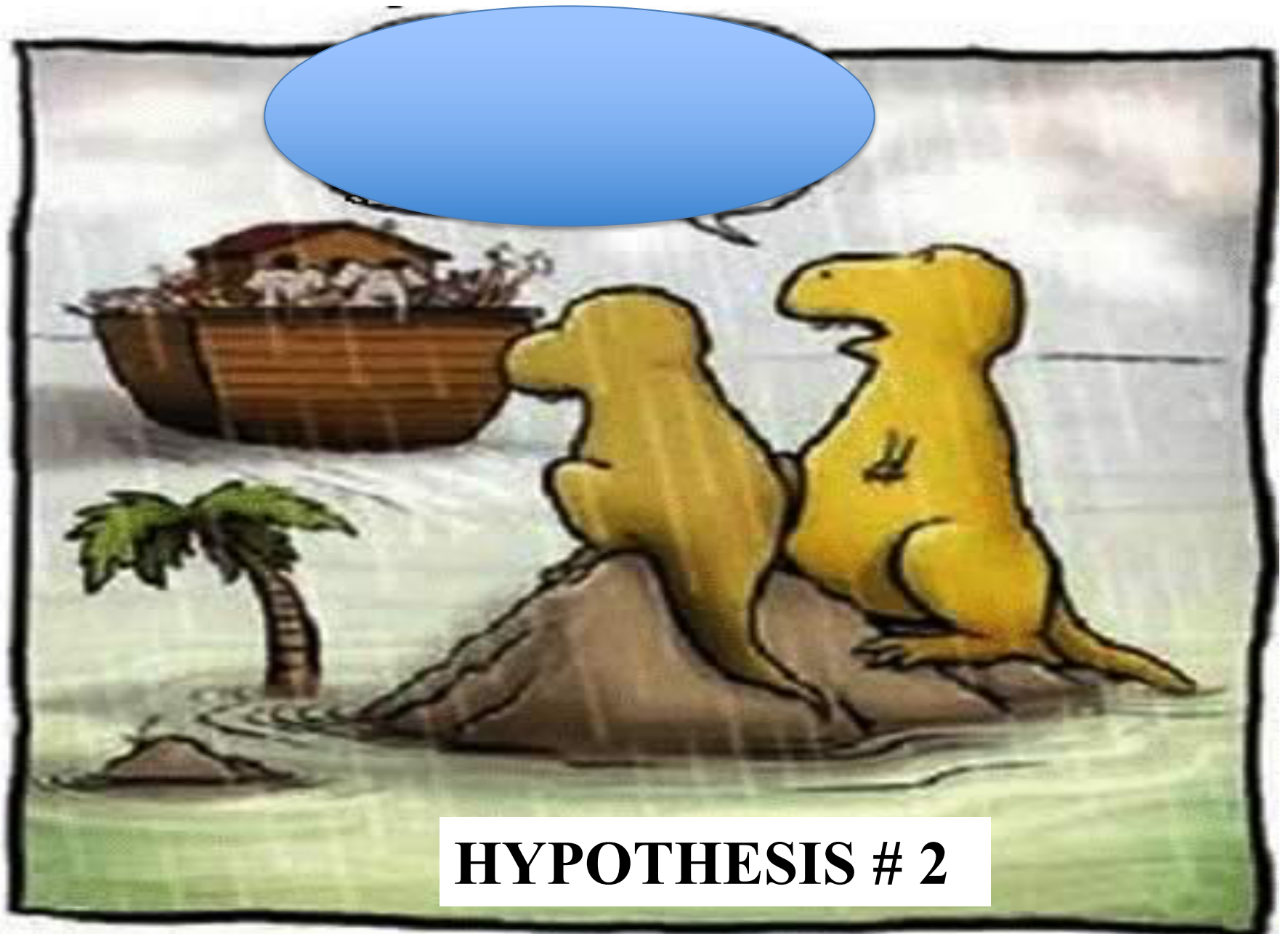
**“A CATASTROPHIC COLLISION OF AN
ASTEROID WITH THE EARTH RESULTING IN
MILLENIA OF CLIMATE CHANGE THAT
EVENTUALLY CAUSED
THE NON-AVIAN DINOSAURS
TO BECOME EXTINCT”**

IN OTHER WORDS “THE DAY THE DINOSAURS DIED”

**WHAT
REALLY DID
HAPPEN
TO
THE
DINOSAURS?**

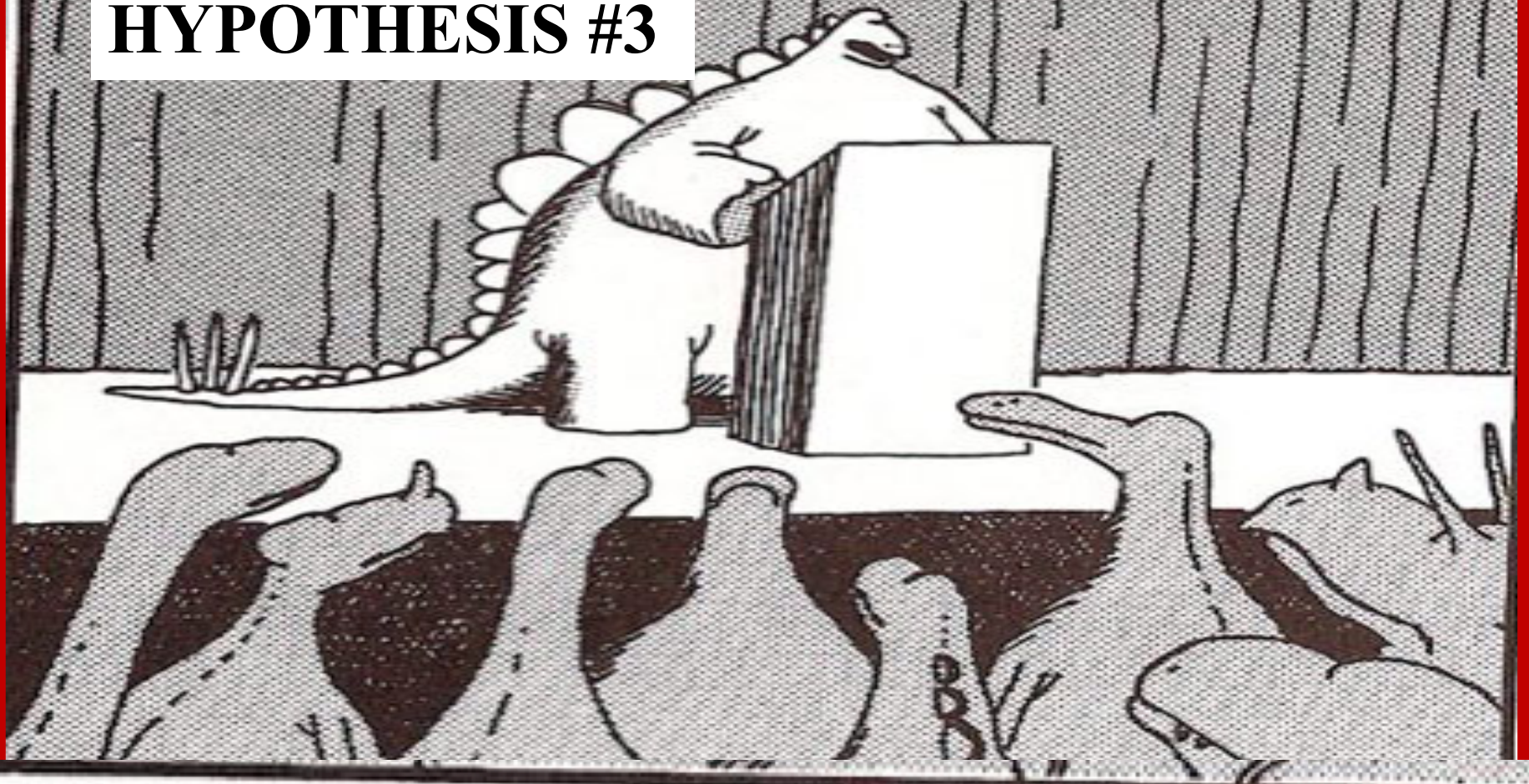


HYPOTHESIS # 1



HYPOTHESIS # 2

HYPOTHESIS #3



"The picture's pretty bleak, gentlemen. ... The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut."



HYPOTHESIS # 4 GETTING CLOSER!!



HYPOTHESIS # 5 BANG!!!!!!

What We Will Talk About

What Really Did Happen to Dinosaurs

Geology 102

Stratigraphy

Index Fossils

Geologic Time (Periods, Eras,

Extinctions in Geologic History

K-T Extinction

Big Things From Space

What are the Odds?

ABSOLUTE MUST SEE!!

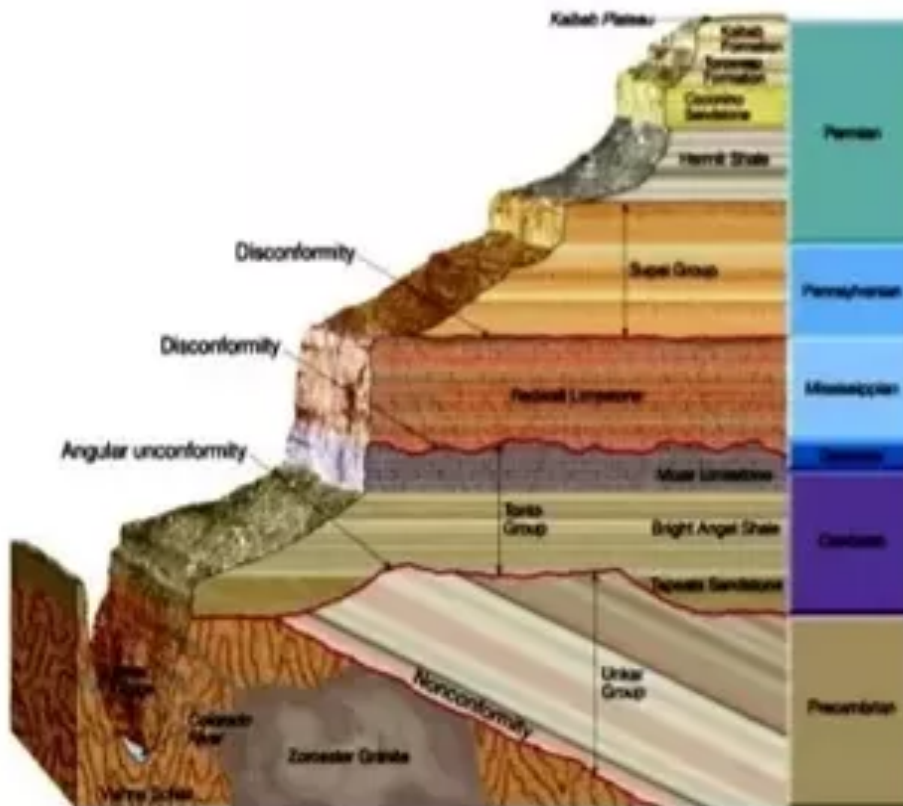
Geology 102

Stratigraphy

Index Fossils

Geologic Time (Periods, Eras,

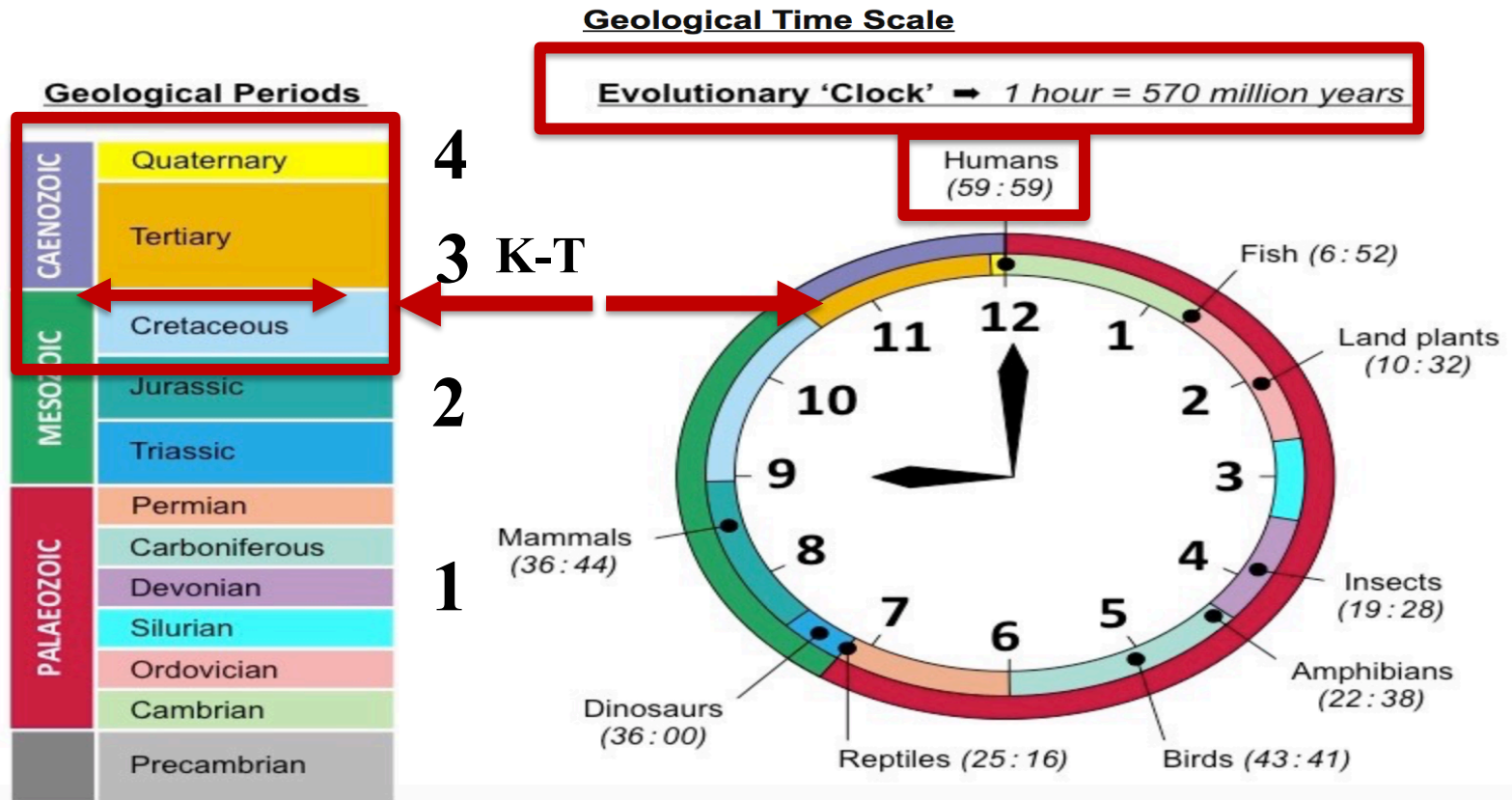
Principles of Stratigraphy



- Superposition
- Original Horizontality
- Lateral Continuity
- Crosscutting Relationships
- Inclusions
- Faunal (biological) Succession
- Incomplete record
- Base-level
- Accommodation
- Preservation Potential
- Cyclicality
- Walther's Law
- Correlation

NO TEST!!

- ❑ The term **Cretaceous** is derived from the Latin “creta” (chalk), and is usually abbreviated **K** for its German translation Kreide (chalk).
- ❑ That is why its boundary with the Tertiary (**T**) is **K-T**.
- ❑ It is also called the K-Pg boundary! (PG=**PALEOGENE**).















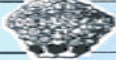











Index Fossils




A good index fossil is one with 4 characteristics:

1. Distinctive
2. Widespread
3. Abundant
4. Limited in geologic time.



CENOZOIC ERA (Age of Recent Life)	Quaternary Period		<i>Pecten gibbus</i>		<i>Neptunea tabulata</i>	
	Tertiary Period		<i>Calyptraphorus velatus</i>		<i>Venericardia planicosta</i>	
MESOZOIC ERA (Age of Medieval Life)	Cretaceous Period		<i>Scaphites hippocrepis</i>		<i>Inoceramus labiatus</i>	
	Jurassic Period		<i>Perisphinctes tiziani</i>		<i>Nerinea trinodosa</i>	
	Triassic Period		<i>Trophites subbullatus</i>		<i>Monotis subcircularis</i>	
PALEOZOIC ERA (Age of Ancient Life)	Permian Period		<i>Leptodus americanus</i>		<i>Parafusulina bosei</i>	
	Pennsylvanian Period		<i>Dictyoclostus americanus</i>		<i>Lophophyllidium proliferum</i>	
	Mississippian Period		<i>Cactocrinus multibrachiatus</i>		<i>Prolecanites gurleyi</i>	
	Devonian Period		<i>Mucrospirifer mucronatus</i>		<i>Palmatolepus unicornis</i>	
	Silurian Period		<i>Cystiphyllum niagarense</i>		<i>Hexamoceras hertzeri</i>	
	Ordovician Period		<i>Bathyrurus extans</i>		<i>Tetragraptus fructicosus</i>	
	Cambrian Period		<i>Paradoxides pinus</i>		<i>Billingsella corrugata</i>	
PRECAMBRIAN						

GEOLOGIC TIME SCALE

ERA	PERIOD	EPOCH	SUCCESION OF LIFE
CENOZOIC recent life	QUATERNARY 0-1 Million Years Rise of Man	Recent Pleistocene	
	TERTIARY 62 Million Years Rise of Mammals	Pliocene Miocene Oligocene Eocene	
MESOZOIC middle life	CRETACEOUS 72 Million Years Modern seed bearing plants, Dinosaurs		
	JURASSIC 46 Million Years First birds		
	TRIASSIC 49 Million Years Cycads, first dinosaurs		
PALEOZOIC ancient	PERMIAN 50 Million Years First reptiles		
	Carboniferous		PENNSYLVANIAN 30 Million Years First insects
			MISSISSIPPIAN 35 Million Years Many crinoids
	DEVONIAN 60 Million Years First seed plants, cartilage fish		
	SILURIAN 20 Million Years Earliest land animals		
	ORDOVICIAN 75 Million Years Early bony fish		
	CAMBRIAN 100 Million Years Invertebrate animals, Brachiopods, Trilobites		
	PRECAMBRIAN Very few fossils present (bacteria-algae-pollen?)		

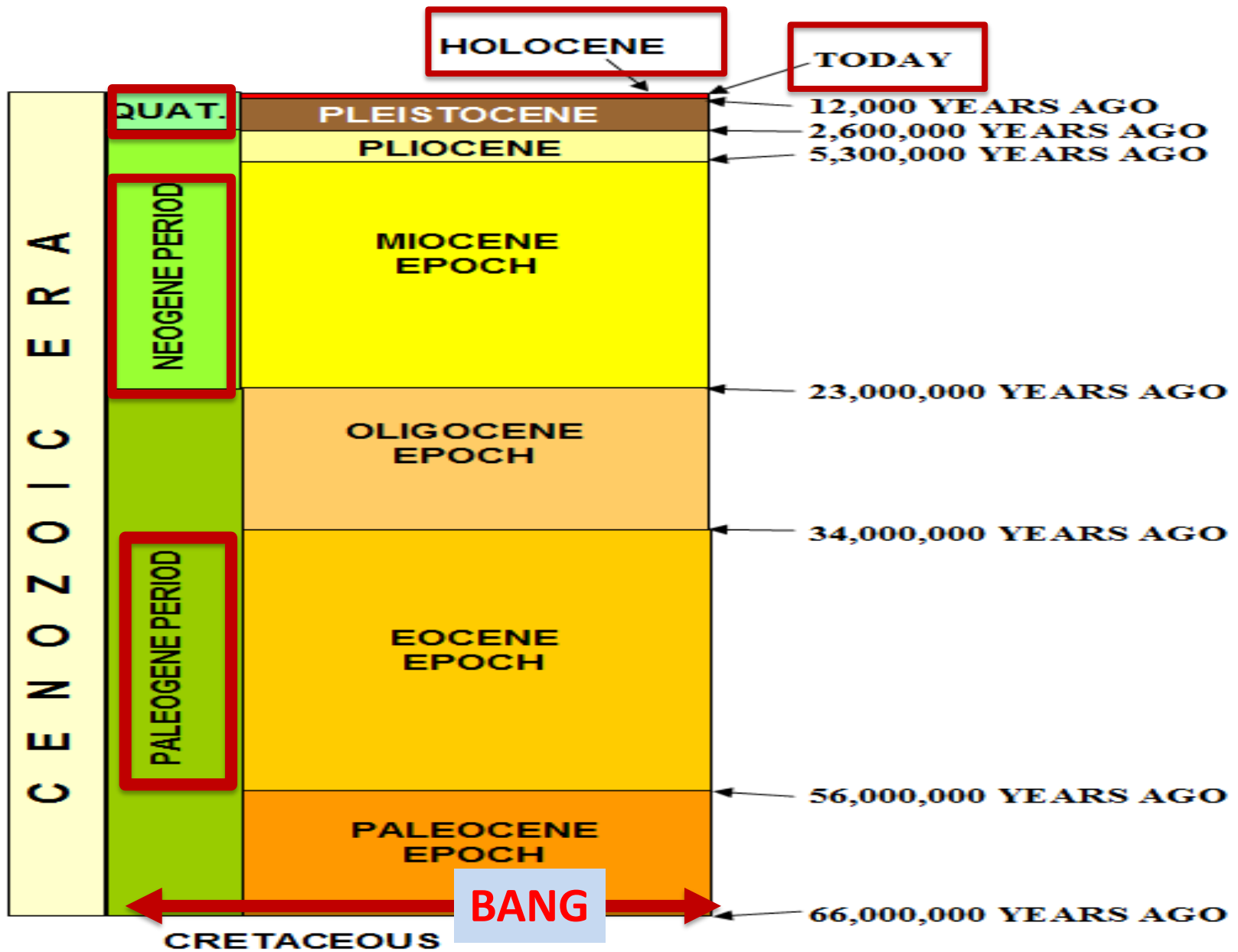


Extinction 4

Extinction 3

Extinction 2

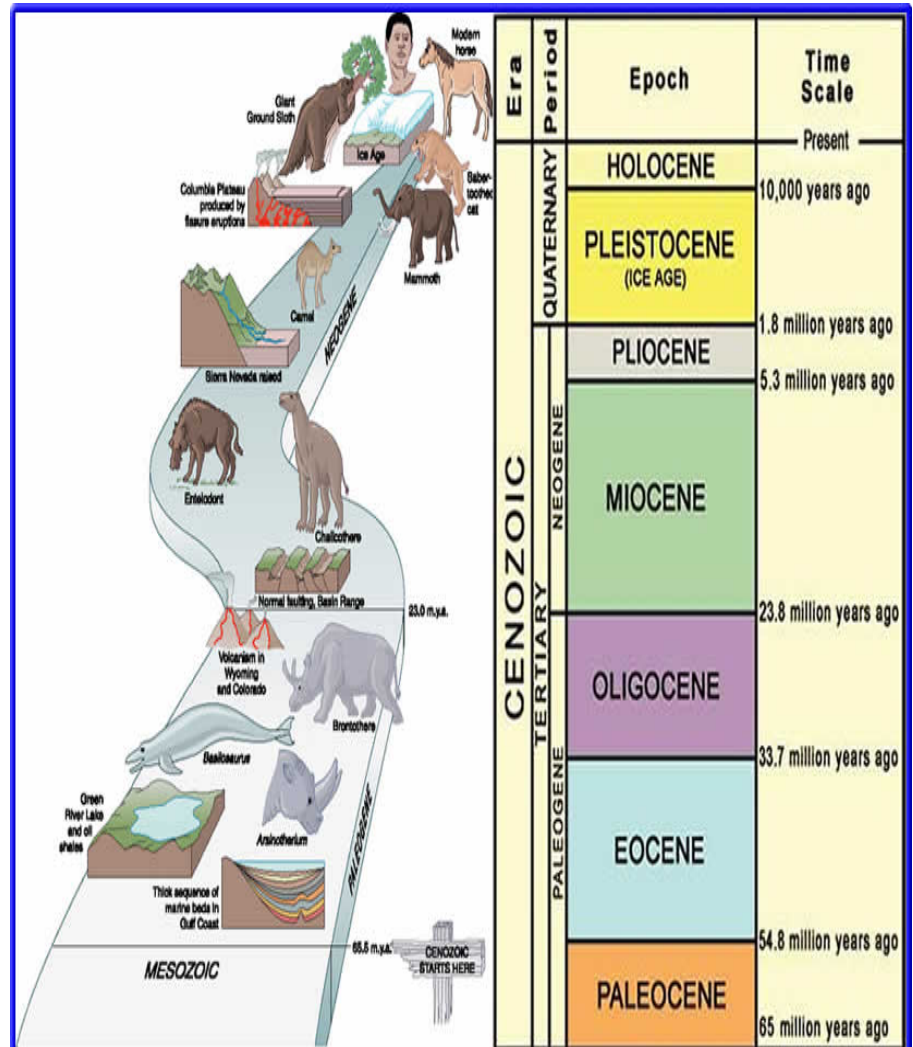
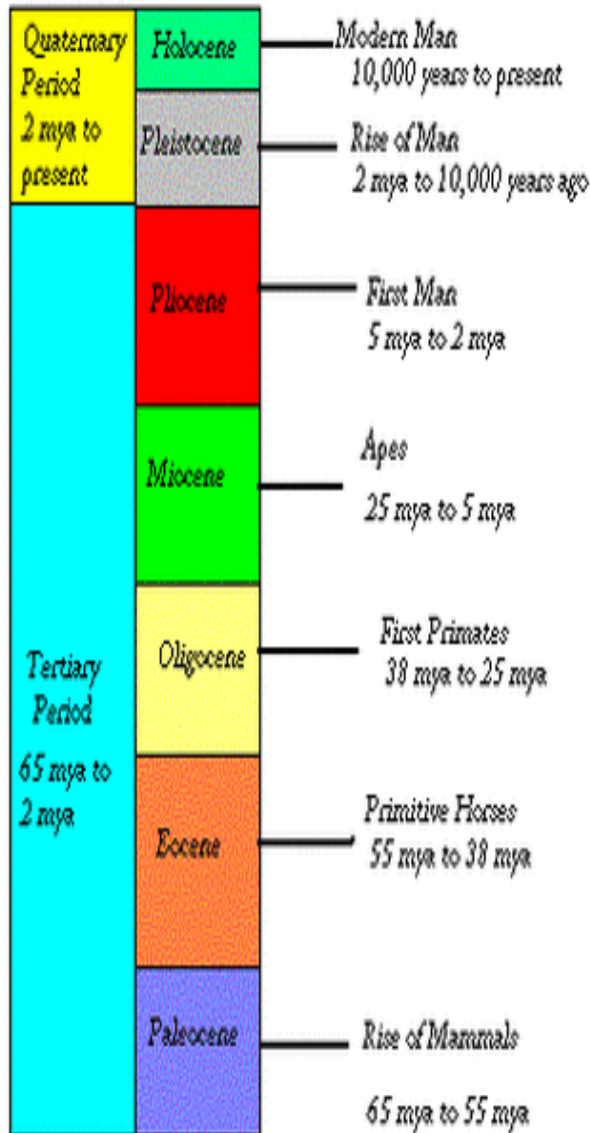
Extinction 1



CENOZOIC ERA

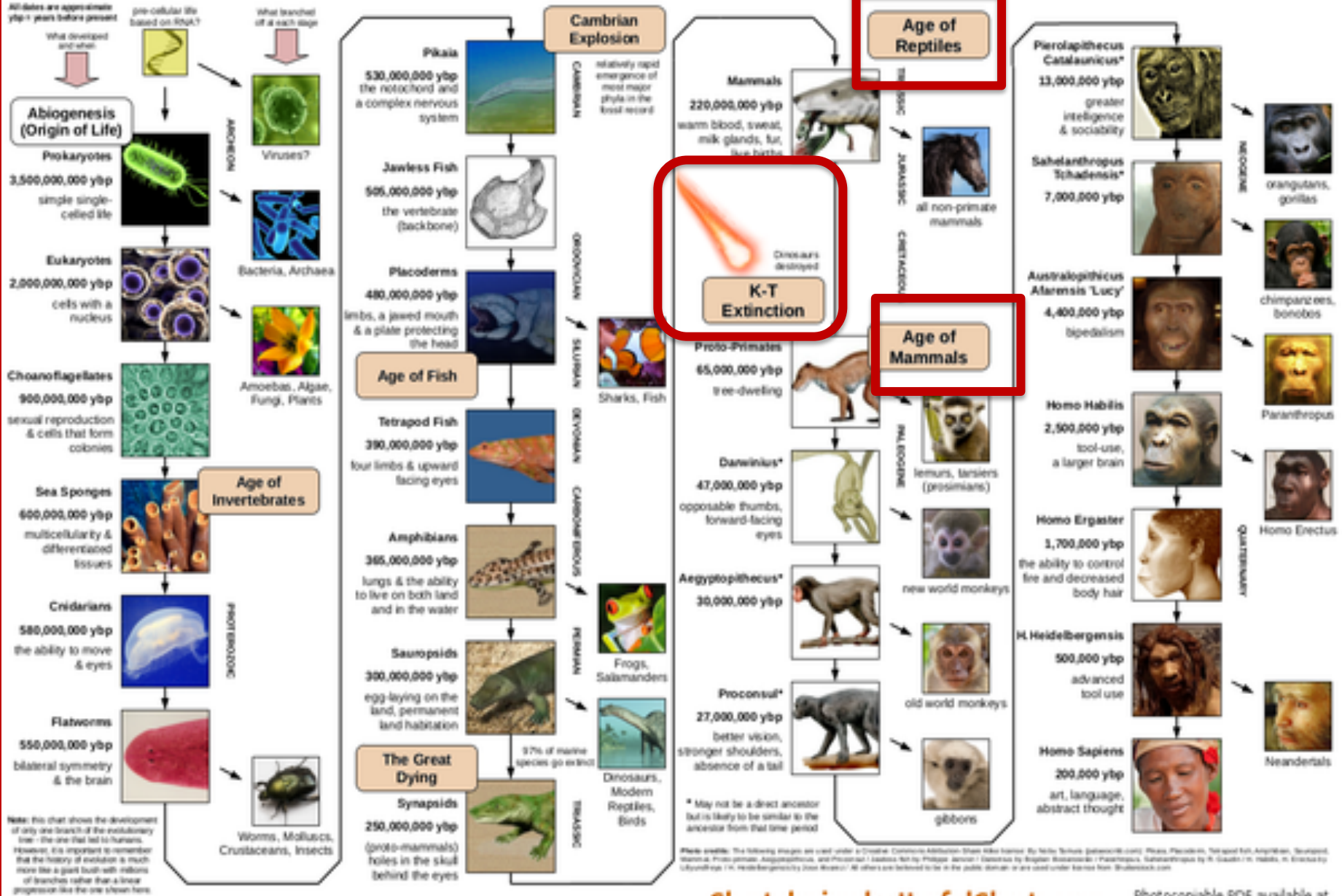
- ❑ The Cenozoic spans 65 million years, from the end of the Cretaceous Period and the extinction of non-avian dinosaurs to the present.
- ❑ The Cenozoic is called the Age of Mammals, because the largest land animals have been mammals during that time.
- ❑ This is a misnomer for several reasons:
 - ✓ The history of mammals began long before the Cenozoic.
 - ✓ The diversity of life during the Cenozoic is far wider than mammals.
- ❑ The Cenozoic could have been called the:
 - ✓ Age of Flowering Plants
 - ✓ Age of Insects
 - ✓ Age of Teleost Fish
 - ✓ Age of Birds

Cenozoic Era



The Cenozoic Era is the most modern geologic era: the beginning was marked by the K-T extinction, and the era continues to the present. From the earliest to the most recent, the Cenozoic Era is divided into the Tertiary Period, which is subdivided into the Paleocene, Eocene, Oligocene, Miocene, and Pliocene Epochs, and the Quaternary Period, which is subdivided into the Pleistocene and Holocene Epochs (Kazlev 2002).

The Evolution of Humans from Single Cells to Today



Extinctions in Geologic History



Flood basalt eruptions

- ❑ Flood basalt eruptions: large-scale volcanic activity, both in extent and duration, that can occur on land or on the ocean floor.
- ❑ A flood basalt may continue to erupt for tens of thousands - possibly millions - of years and the lava can cover hundreds of thousands of kilometres. DECCAN TRAPS

POSSIBLE CAUSES OF MASS EXTINCTIONS

Climate Change

- ❑ Earth's climate is not constant.
- ❑ Over geological time, the Earth's dominant climate has gone from ice age to tropical heat and from steamy jungles to searing deserts.





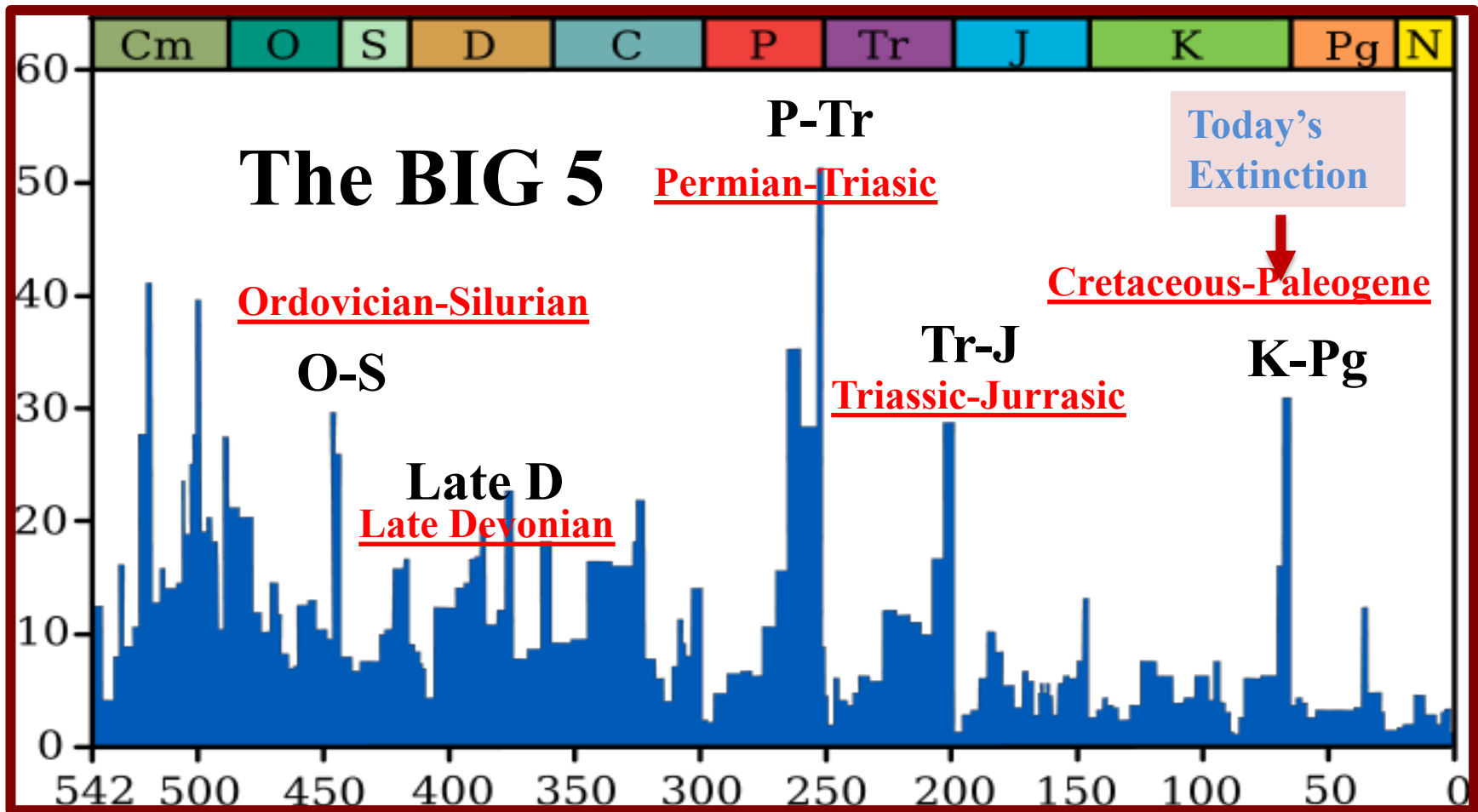
Catastrophic methane release

- ❑ Catastrophic methane release has been suggested as a possible cause of mass extinction.
- ❑ Methane clathrate is an ice-like substance formed from water and methane in the sea bed, arctic lakes and permafrost.



Impact events

- ❑ Impact events are when the planet is struck by a comet or meteor large enough to create a huge shockwave felt around the globe.
- ❑ Widespread dust and debris rain down, disrupting the climate and causing extinction on a global scale.



- The graph shows the apparent percentage of marine animal genera becoming extinct during any given time interval.
- It does not represent all marine species, just those that are readily fossilized.



5 TIMES!

**MAYBE I'LL
TRY A
SIXTH!**

©SHANNON
WHEELER

“Have you tried turning it off and on again?”

EXTINCTION

~~CATASTROPHE~~

~~CRISIS~~

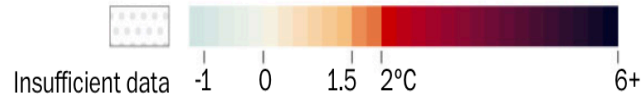
~~CHANGE~~



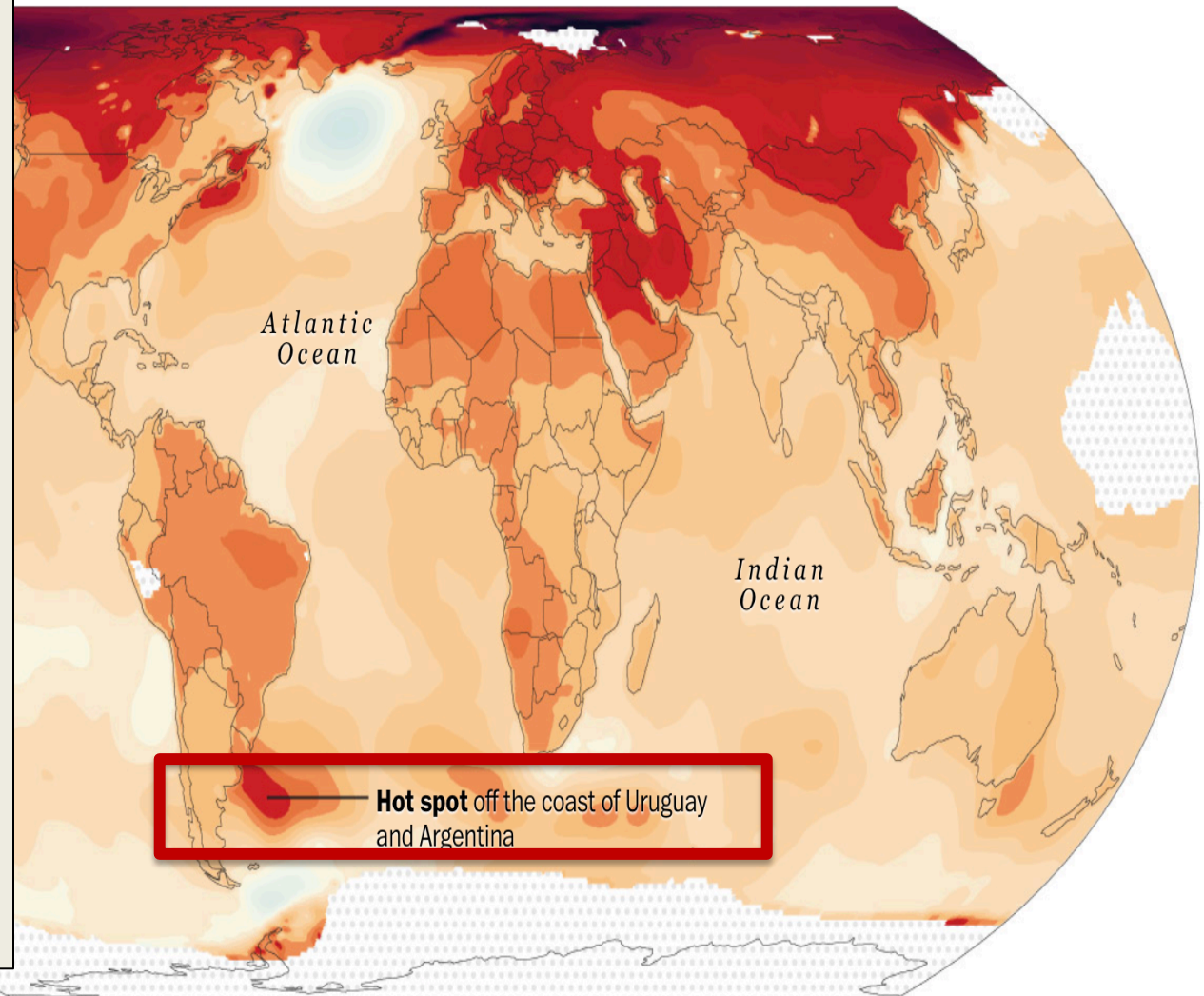


The Great Flood of 2019: A Complete Picture of a Slow-Motion Disaster

Temperature change, 2014-2018 compared with 1880-1899

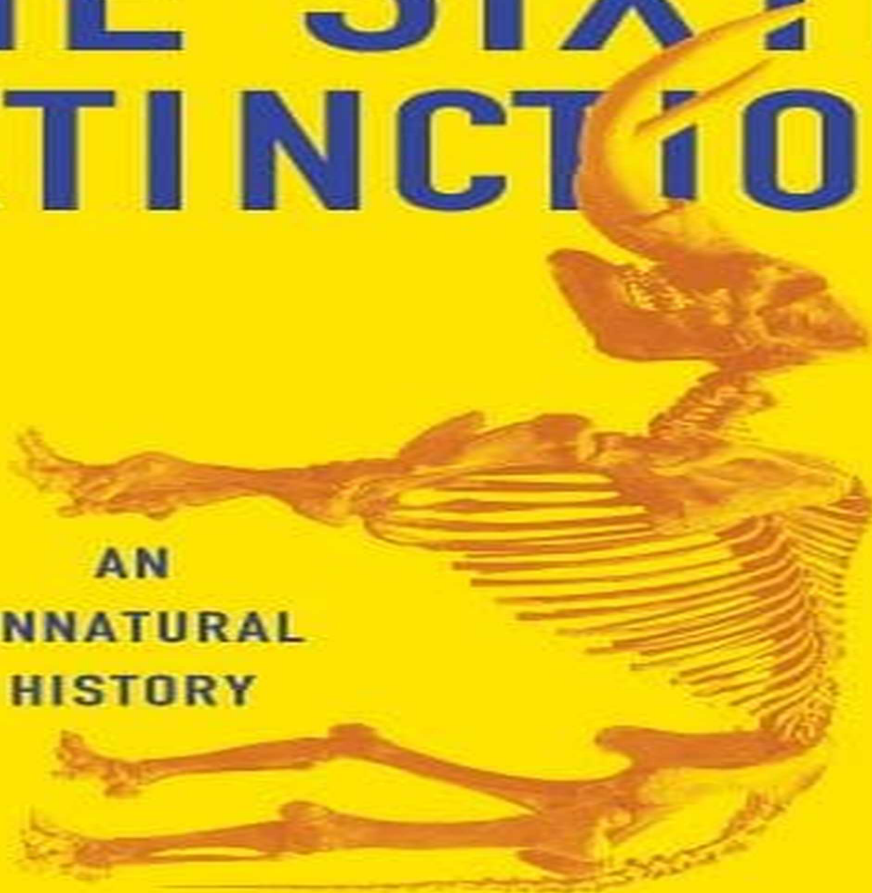


- The entire global ocean is warming, but some parts of it are changing much faster than others – like a hot spot off Uruguay.
- There, researchers have observed mass die-offs of clams, dangerous ocean heat waves and algal blooms, and changes in Uruguay's fish catch.
- Around the planet, enormous ocean currents are traveling to new locations.
 - ✓ As they relocate, waters are growing warmer.



THE SIXTH EXTINCTION

AN
UNNATURAL
HISTORY



ELIZABETH KOLBERT

Author of *FIELD NOTES
FROM A CATASTROPHE*

The
Uninhabitable
Earth

Life After Warming

David
Wallace-Wells



- ❑ It is worse, much worse, than you think.
- ❑ If your anxiety about global warming is dominated by fears of sea-level rise, you are barely scratching the surface—
 - ✓ food shortages
 - ✓ refugee emergencies
 - ✓ climate wars
 - ✓ economic devastation