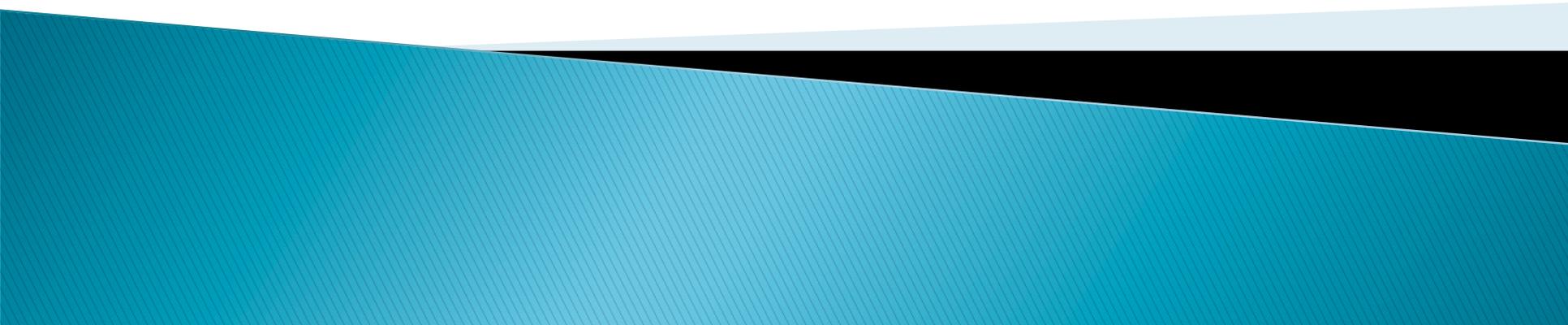


Geologic Time Scale

What is a scale?

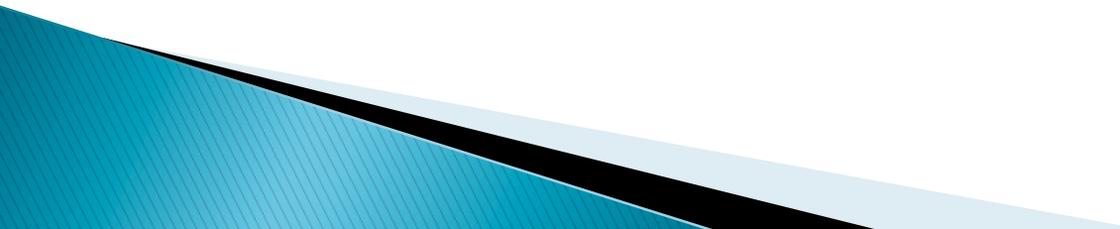


Where are you?



K

12



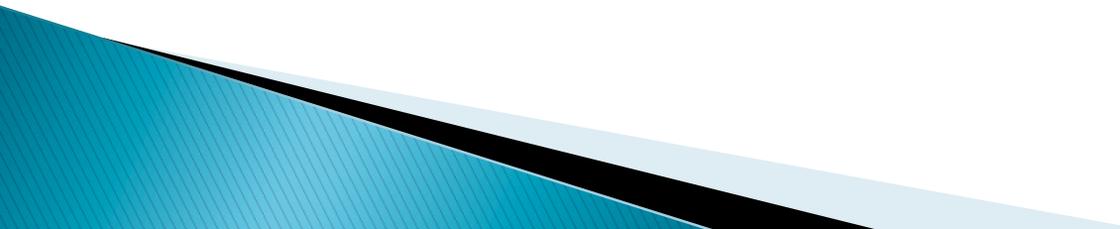
Where are you?

K	1	2	3	4	5	6	7	8	9	10	11	12
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Geologic Time Scale

- ▶ Geologic Time Scale – a timeline of Earth's History divided into periods of time by major events or changes on Earth

We call these changes
CATASTROPHIC EVENTS.

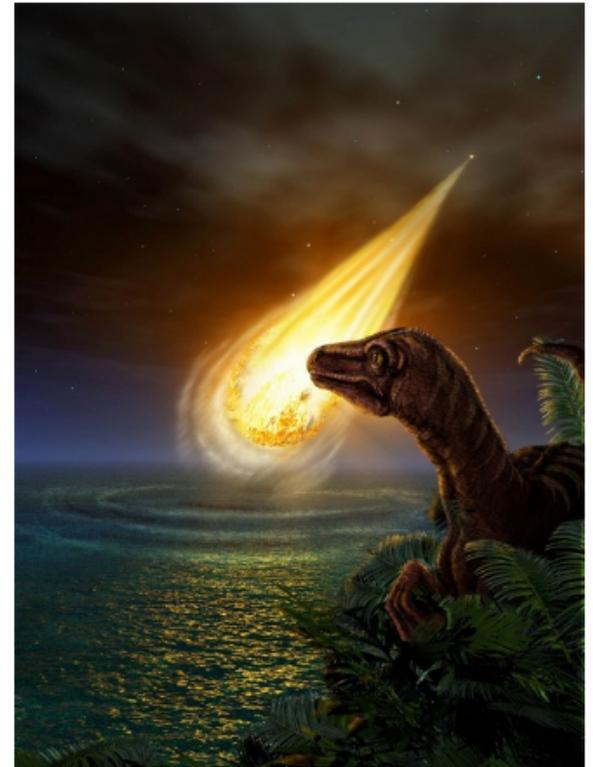


Catastrophic Events

Catastrophic Events – events that cause major destruction or change life completely

Examples:

- ▶ Mass extinctions
- ▶ Ice Ages
- ▶ Meteors
- ▶ Major volcanic eruptions



We measure geologic time in millions of years (bya/mya– billion/million years ago)

Divisions of geologic time:

EONS – largest division of time

ERAS – 2 or more eras make an eon

PERIOD – 2 or more periods make an era

EONS

- ▶ 1. Hadean (4.5 bya, Precambrian)
- ▶ 2. Archaean (3.8 bya, Precambrian)
- ▶ 3. Proterozoic (2.5 bya Precambrian)
- ▶ 4. Phanerozoic (540 mya, 3 eras; LIFE begins)

PRECAMBRIAN TIME

AMOUNT OF TIME:

- ▶ 90% of Earth's history
- ▶ Lasted nearly 4 billion years of Earth's 4.5 billion year total

MAIN EVENTS:

- ▶ Beginning formation of the earth & solar system
- ▶ Volcanic ash & dust -> clouds formed -> rain -> oceans
- ▶ Undersea continent-building
- ▶ Single-celled micro-organisms in ocean @ the end
(creating oxygen & reducing salt in oceans)
- ▶ Process of tectonics
- ▶ NO animals! and NO plants!

Hadean Eon 4.5–3.8 bya

- ▶ During the Hadean Eon, the solar system was forming. Many destructive forces combined to create a DEAD earth. Planetoids crashed into the earth and broken pieces of hot rock began orbiting the earth. These hot rocks combined to form the moon.
- ▶ Although the earth was hot molten (liquid) rock during this eon, the heavier molten iron sank into the core, and the lighter rock rose to the surface. The earth was far enough away from the sun, that when lighter rock rose to the surface, that outer layer was able to cool enough to harden and form a crust.



Hadean Eon 4.5–3.8 bya

- On earth, volcanoes filled the atmosphere with cloud-forming dust. Rain from the clouds fell and began to create oceans. There was no life.

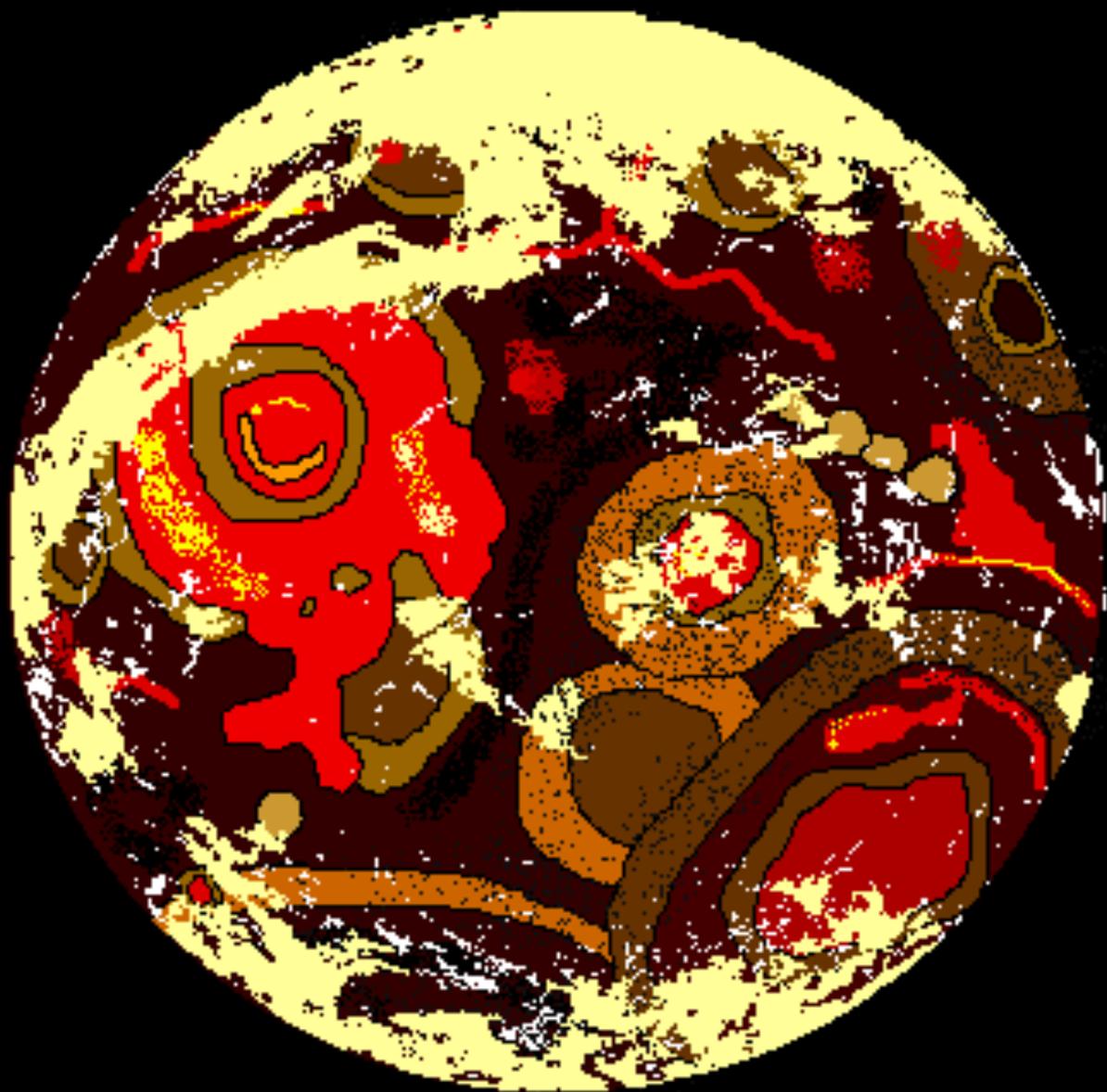


Hadean Eon 4.5–3.8 bya

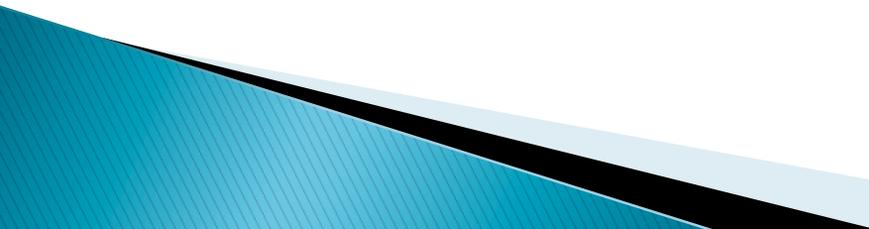
- ▶ In addition to volcanoes, there is a constant rain of rocks and asteroids from space, which cause impact craters in the crust.
 - ▶ Although the air is hot, thick, steamy, and full of dust, it was made of nothing but carbon dioxide and water vapor, with traces of nitrogen and smelly sulfur compounds.
- 







Archaean Eon 3.8–2.5 bya

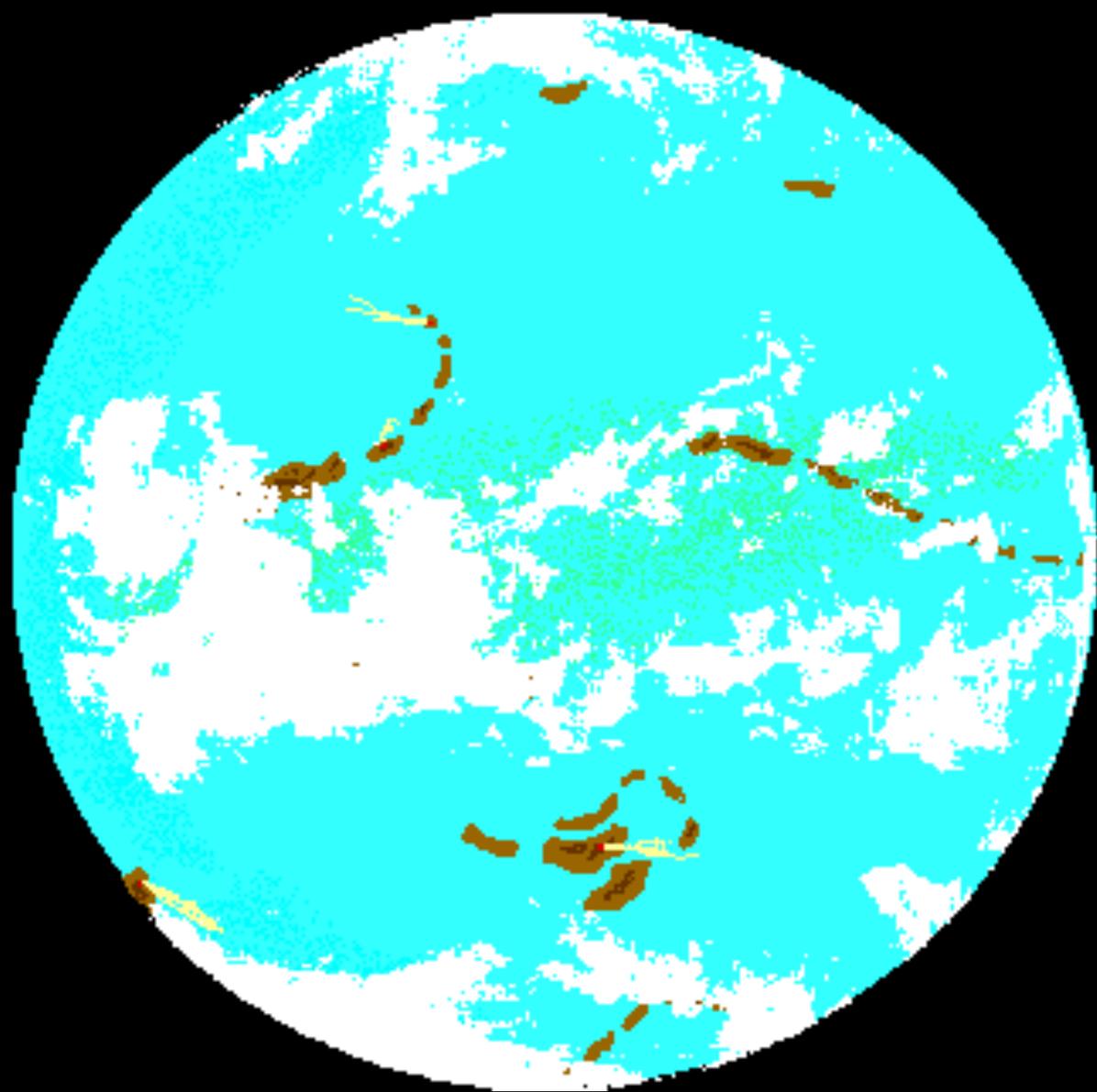
- ▶ During the Archaean Eon, the earth was covered with thick soupy seas, not land (except the volcanoes). It was a time of continent-building. In fact, 70% of our modern land masses are formed around cores of rock that date from the Archaean Eon. These rocks probably began as lava that flowed into and under the oceans.
 - ▶ The asteroid and meteor showers were mostly gone by this time.
- 



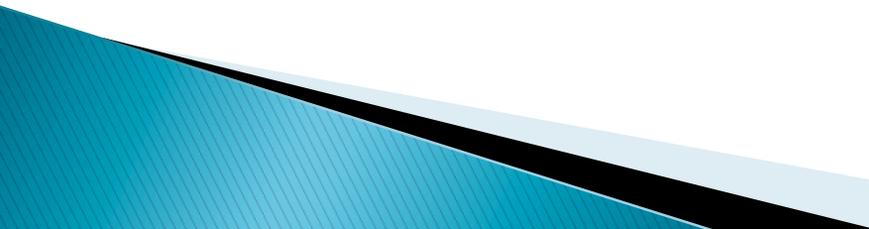
Archaean Eon 3.8–2.5 bya

- ▶ For most of this eon, there was no oxygen, but instead the air was full of hydrogen and toxic gasses like ammonia and methane. However, towards the end of this eon, cells in the ocean began making oxygen.





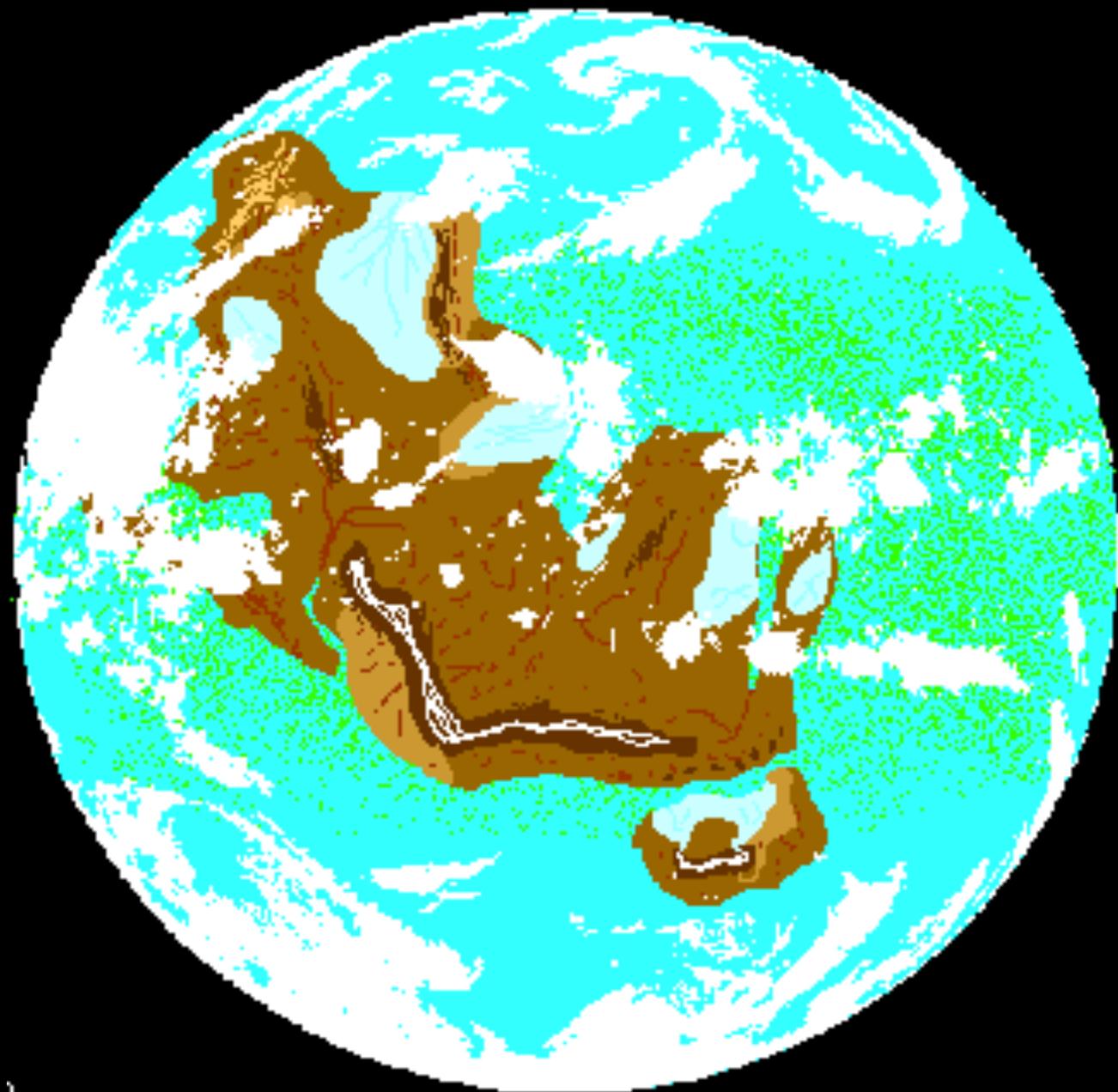
Proterozoic Eon 2.5 bya– 543 mya

- ▶ During the Proterozoic Eon, the earth was cooling. Very thin land masses (called plates), rested on hot molten rock (called magma) that flowed under the crust of the earth.
 - ▶ The magma was much hotter and more liquid than it is today, which caused continental movement with frequent collisions and land fractures. The result was the formation of a single super-continent.
- 



Proterozoic Eon 2.5 bya– 543 mya

- ▶ The air was filling with oxygen, but the oceans were too salty for anything, but single-celled organisms to survive. A new cell started using the salt to build shells, which made the oceans less salty.



Phanerozoic Eon – 543 mya – Now “Cambrian”

- ▶ Explosion of Life!
- ▶ Contains 3 Eras:
 - Paleozoic Era – “Age of Amphibians”
 - Mesozoic Era – “Age of Dinosaurs”
 - Cenozoic Era – “Age of Mammals”

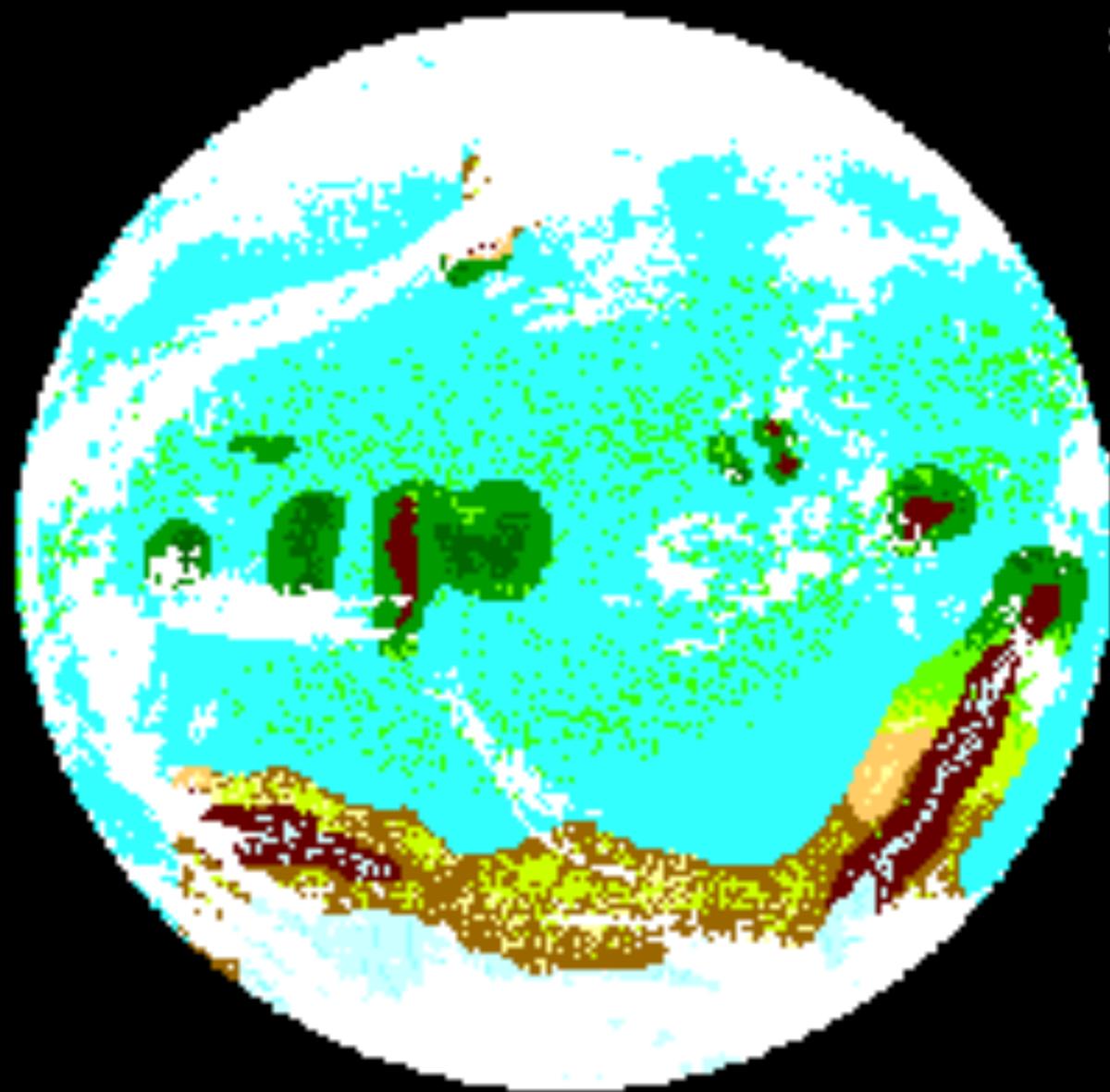
Phanerozoic Eon

- ▶ During the Phanerozoic Eon, which began 543 million years ago, there was an explosion of life.
- ▶ This eon had 3 eras. The Paleozoic Era, the Mesozoic Era, and the Cenozoic Era.
- ▶ In the Paleozoic Era ocean life developed, as well as reptiles, insects, and some plants.
- ▶ The Mesozoic Era was the time of the dinosaurs, small mammals, and flowering plants.
- ▶ Both of these 2 eras ended with a mass extinction.
- ▶ The Cenozoic Era is our current era. In this era there was an ice age, large mammals and birds developed, and people lived on the earth for the first time.

Paleozoic Era = “Ancient”

543 mya – 248 mya

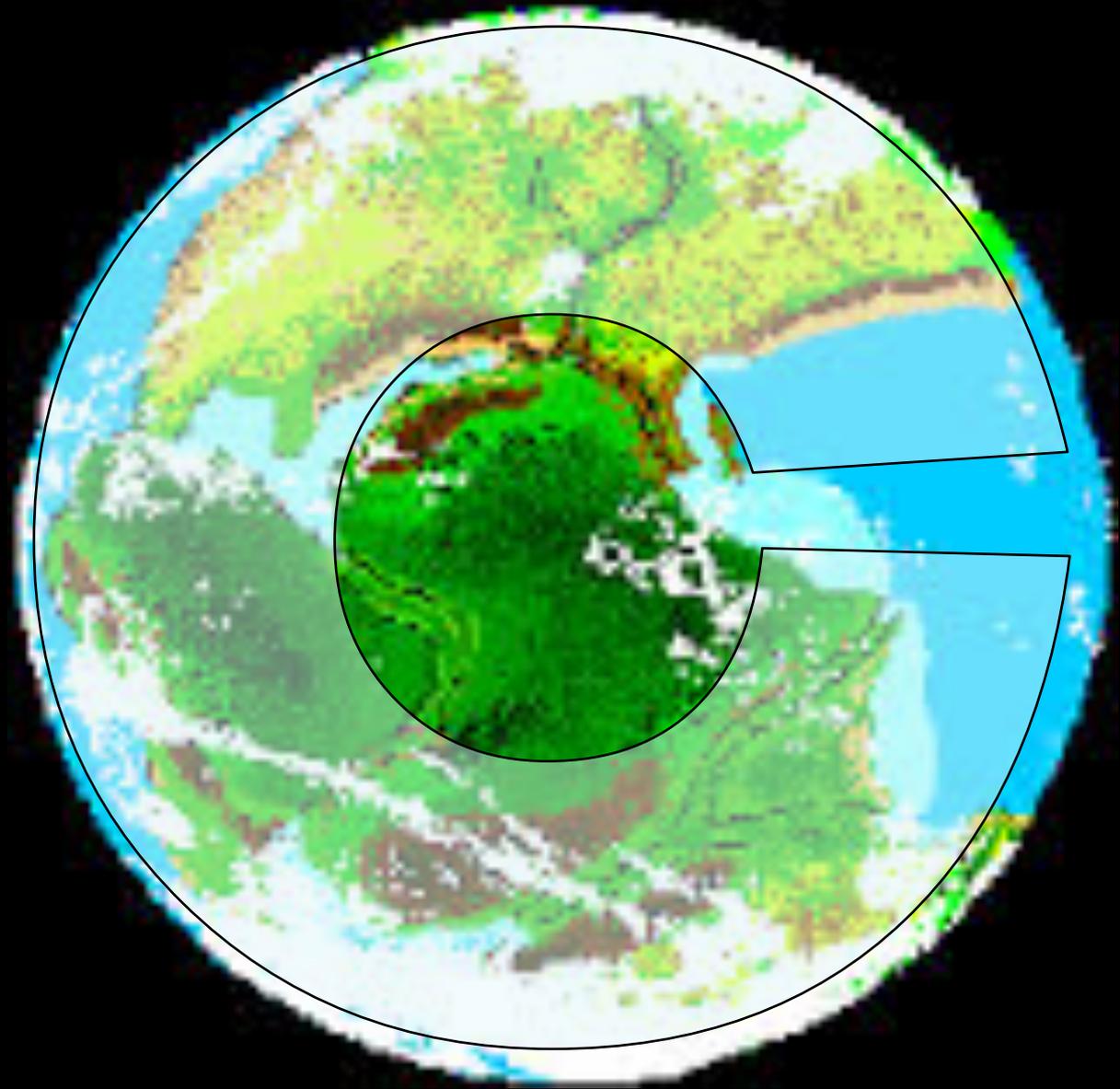
- ▶ Life in the **ocean** developed (**Fish**, plants, etc.)
- ▶ **Reptiles, Insects, Ferns** developed → life moving onto **land** towards the end
- ▶ Ends with a **Mass Extinction** possibly from a **meteor strike** (???) – kills **90%–95%** of all life!



Mesozoic Era = “Ancient” 248 mya – 65 mya

- ▶ Dinosaurs Rule!
- ▶ Small mammals, birds, and flowering plants
- ▶ Temperatures, on land and in the ocean increase
- ▶ The climates were tropical
- ▶ A new and larger super-continent, shaped like a “c” was made from colliding continents
- ▶ Ends with Mass Extinction due to a meteor strike off Mexico
- ▶ Dust cloud blocked sunlight, killed plant life and affected food chain

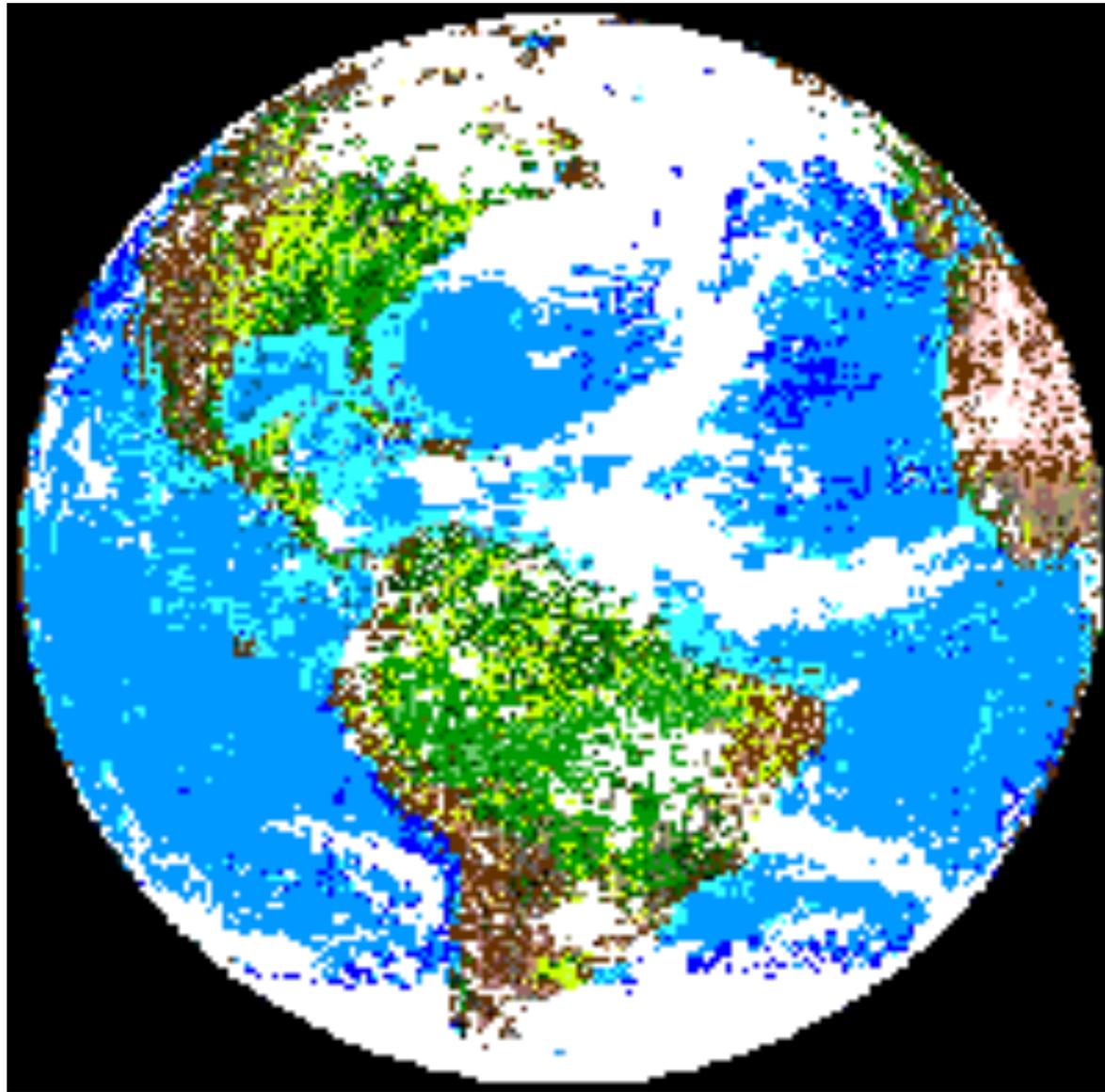




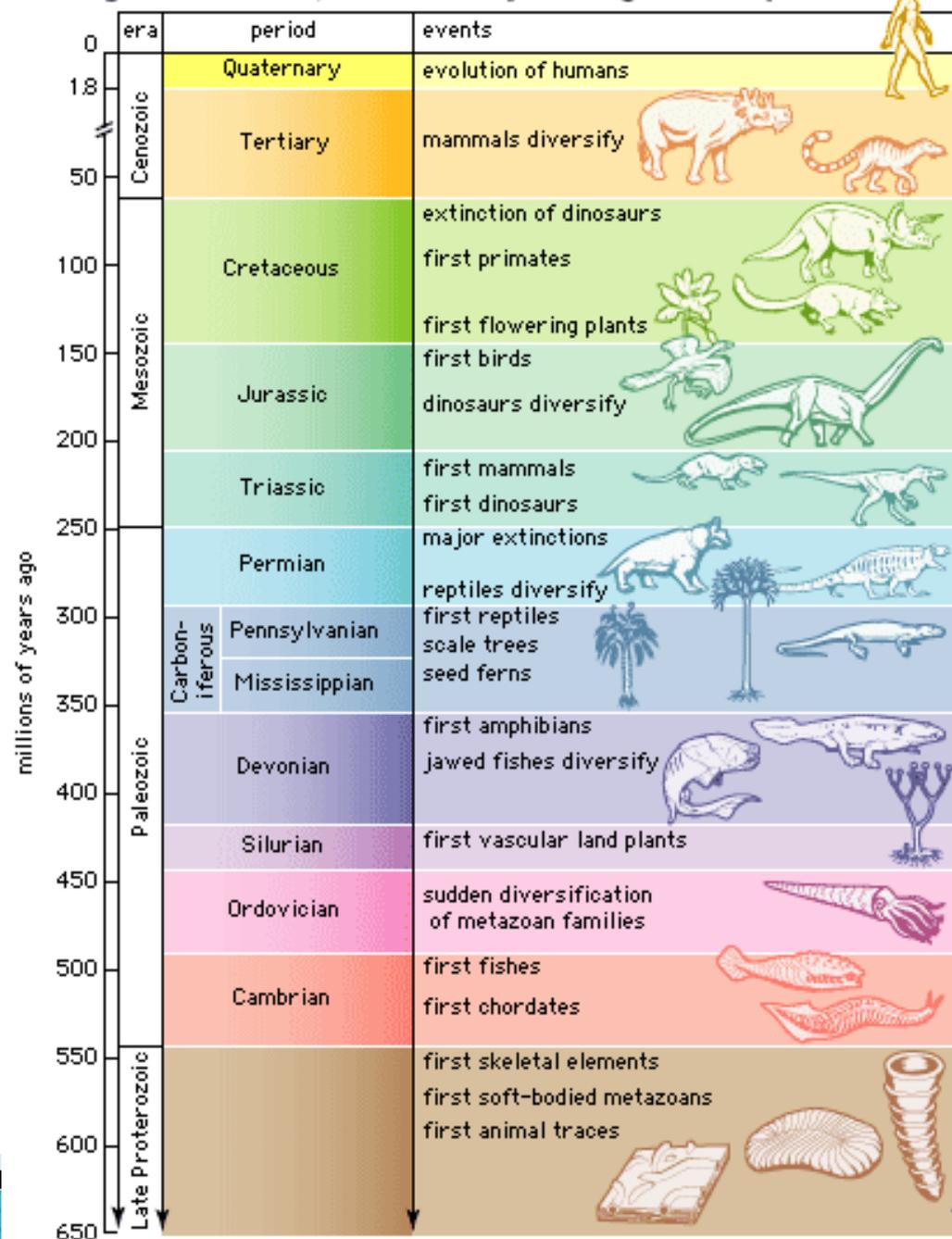
Cenozoic Era = “Recent or New Life”

65 mya – Now

- ▶ **Large** warm-blooded **mammals**, **modern birds**
 - ▶ Animals developed **migration techniques**
 - ▶ Plants and forests flourished
 - ▶ Super-continent **separated** into continents
 - ▶ **Mountain ranges** form from volcanic activity
 - ▶ Ice ages
 - ▶ Humans on the earth for the first time
- 



Geologic time scale, 650 million years ago to the present

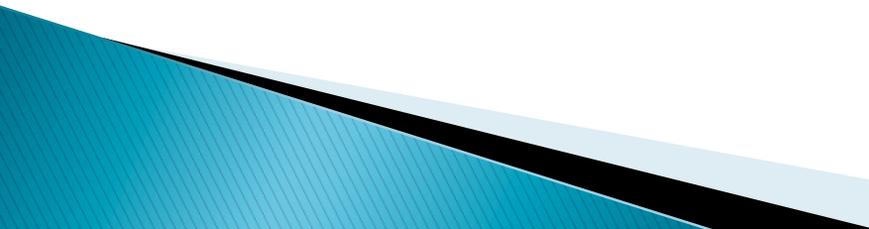


Geologic Time Scale Order

Precambrian Time

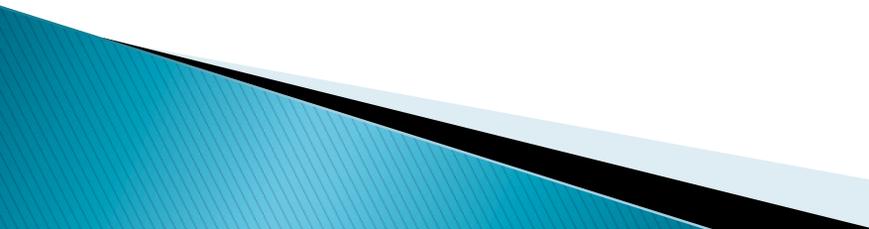
- ▶ Earth formed (4.5 billion years ago)
- ▶ Clouds formed (3 billion years ago)
- ▶ Bacteria (3 billion years ago)
- ▶ Single-celled organisms (3 billion years ago)
- ▶ Blue-green algae (1 billion years ago)

Remember: This is 90% of Earth's History!



Geologic Time Scale Order

Phanerozoic Eon – Paleozoic Era

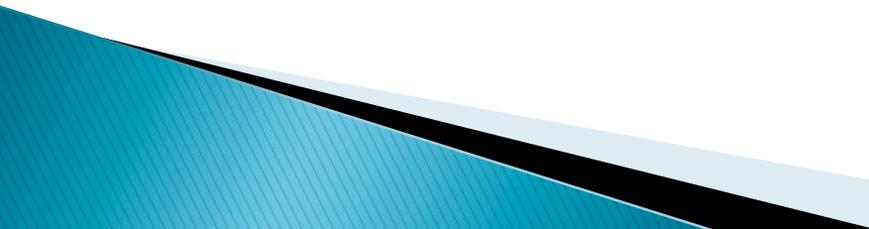
- ▶ Jellyfish & Sponges (600 million years ago)
 - ▶ Fish (480 million years ago)
 - ▶ Ferns (470 million years ago)
 - ▶ Sharks (400 million years ago)
 - ▶ Spiders (400 million years ago)
 - ▶ Reptiles (320 million years ago)
 - ▶ Flying insects (315 million years ago)
 - ▶ ENDED WITH.....?
- 

Geologic Time Scale Order

Phanerozoic Eon – Mesozoic Era

- ▶ Pangaea forms (240 million years ago)
- ▶ First mammal (220 million years ago)
- ▶ First bird (155 million years ago)
- ▶ Flowering plants (120 million years ago)
- ▶ Dinosaurs (75 million years ago)

ENDED WITH...?



Geologic Time Scale Order

Phanerozoic Eon – Cenozoic Era

- ▶ Horses (55 million years ago)
 - ▶ Whales (52 million years ago)
 - ▶ Dogs (37 million years ago)
 - ▶ Cats (25 million years ago)
 - ▶ Mammoths & Elephants (5 million years ago)
 - ▶ Ice Ages in North America (1 million years ago)
 - ▶ First modern man (0.09 million years ago)
- 