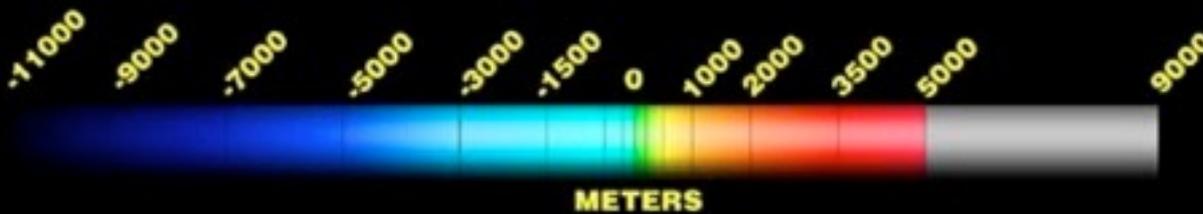
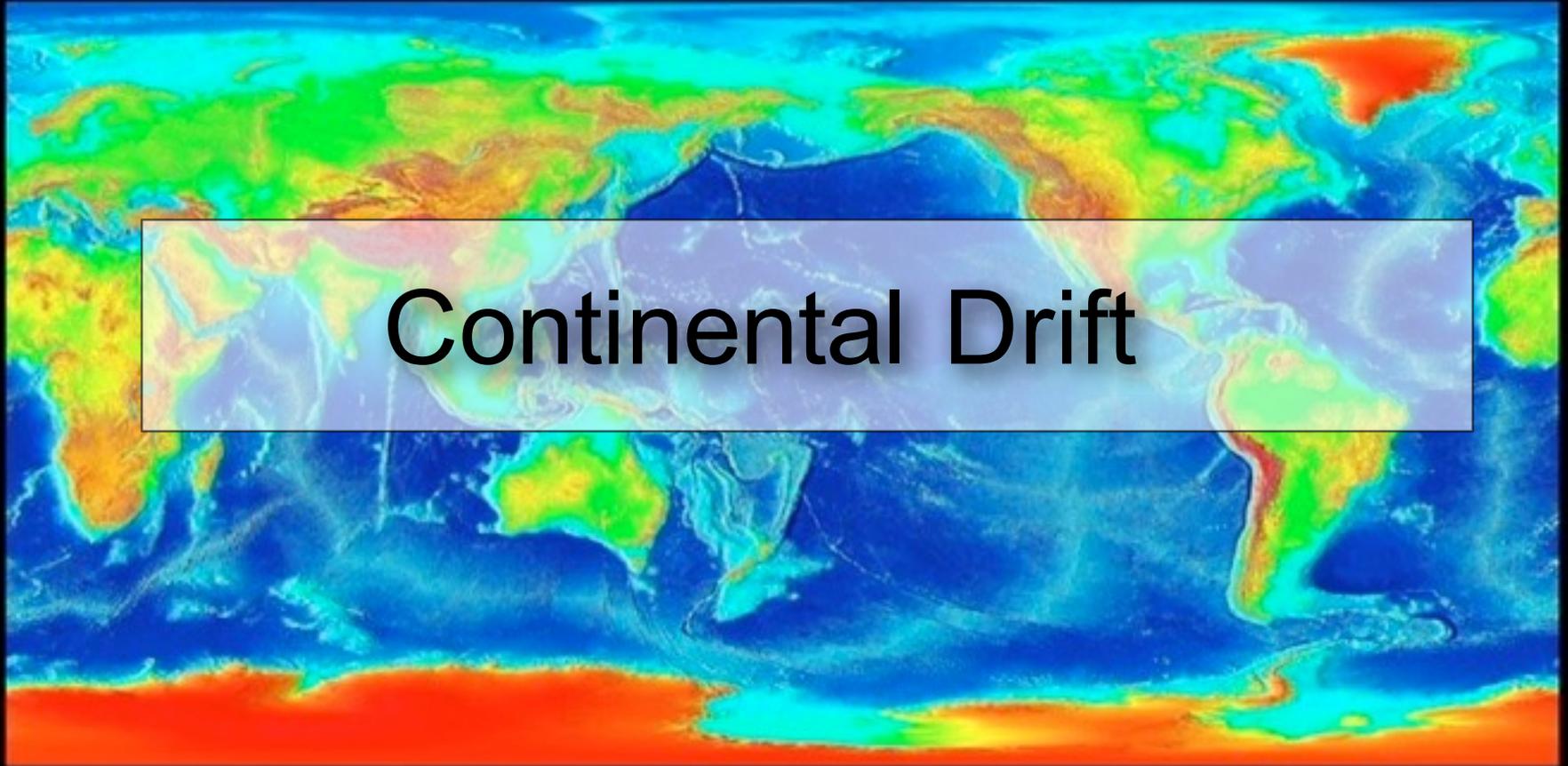


Continental Drift



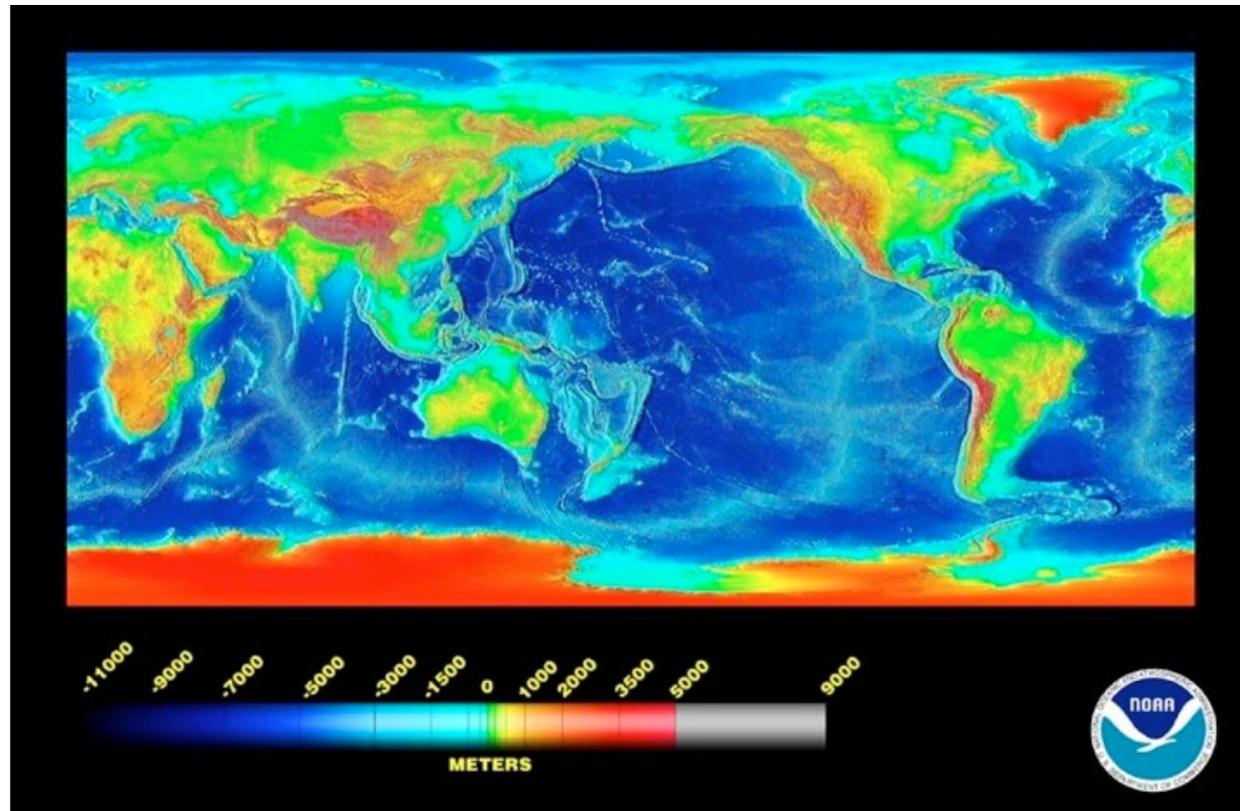
CALIFORNIA STATE
UNIVERSITY
EAST BAY



Continental Drift

The early 20th century paradigm was that the Earth was contracting. Planet is slowly cooling and contracting as heat of formation is lost

- Mountains represent “wrinkles” formed by the contraction of the surface
- Collapse of surface formed ocean basins
- Continents, oceans effectively fixed in place
- Vertical crustal movements dominate



Looking at a map of the Earth, it appears that the continents could fit together like a jigsaw puzzle.



[Wikimedia](#)



Alfred Wegener (1915) proposed the revolutionary idea called "continental drift."

Wegener developed his idea based upon 4 different types of evidence:

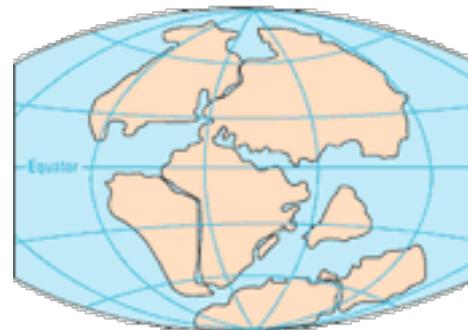
1. Fit of the Continents
2. Fossil Evidence
3. Rock Type and Structural Similarities
4. Paleoclimatic Evidence



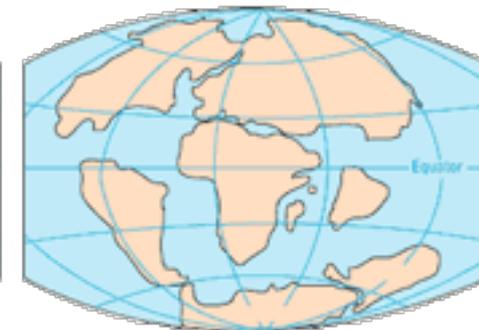
PERMIAN
225 million years ago



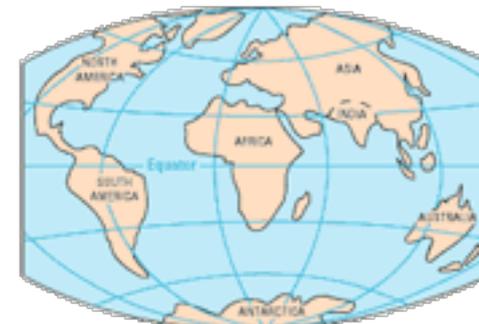
TRIASSIC
200 million years ago



JURASSIC
135 million years ago



CRETACEOUS
65 million years ago



PRESENT DAY

1. Fit of the Continents

It was the amazingly good fit of the continents that first suggested the idea of continental drift.

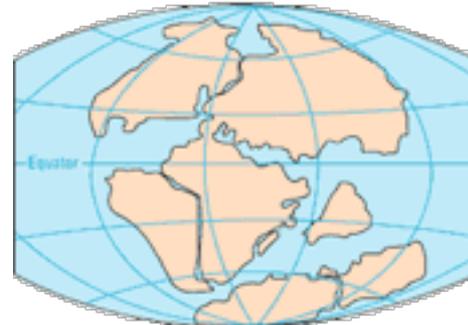
In the 1960's, it was recognized that the fit of the continents could be even further improved by fitting the continents at the edge of the continental slope — the actual extent of the continental crust.



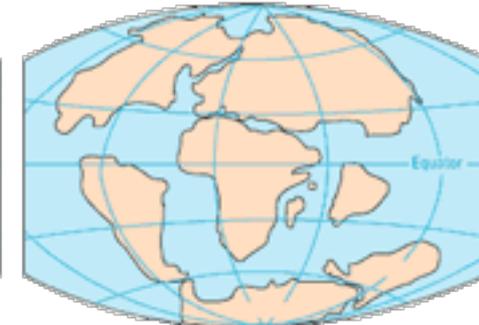
PERMIAN
225 million years ago



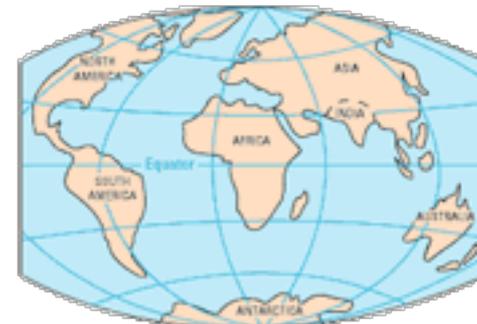
TRIASSIC
200 million years ago



JURASSIC
135 million years ago



CRETACEOUS
65 million years ago



PRESENT DAY

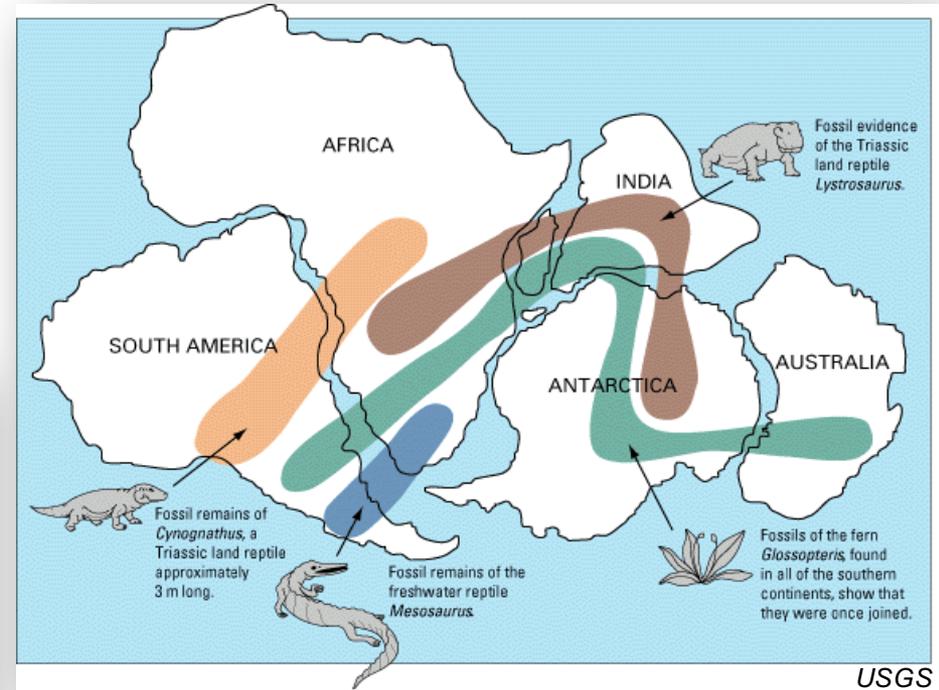
2. Fossil Evidence

Wegener found that fossils were located directly opposite on widely separated continents.



[Wikimedia: Daderot](#)

Wegener concluded that the distribution of these fossils during the same time of Earth history was convincing evidence that the continents were once joined into a "supercontinent."



[Wikimedia: James St. John](#)

3. Rock Type and Structural Similarities

Wegener found similar rock types and geologic structures on continents on opposite sides of the Atlantic Ocean.

The Appalachian Mountains trend along the eastern flank of North America.

Mountains of similar age and structure also appear in Scotland and Scandinavia.

The map shows that, if the continents are joined together, the mountains form a continuous belt.

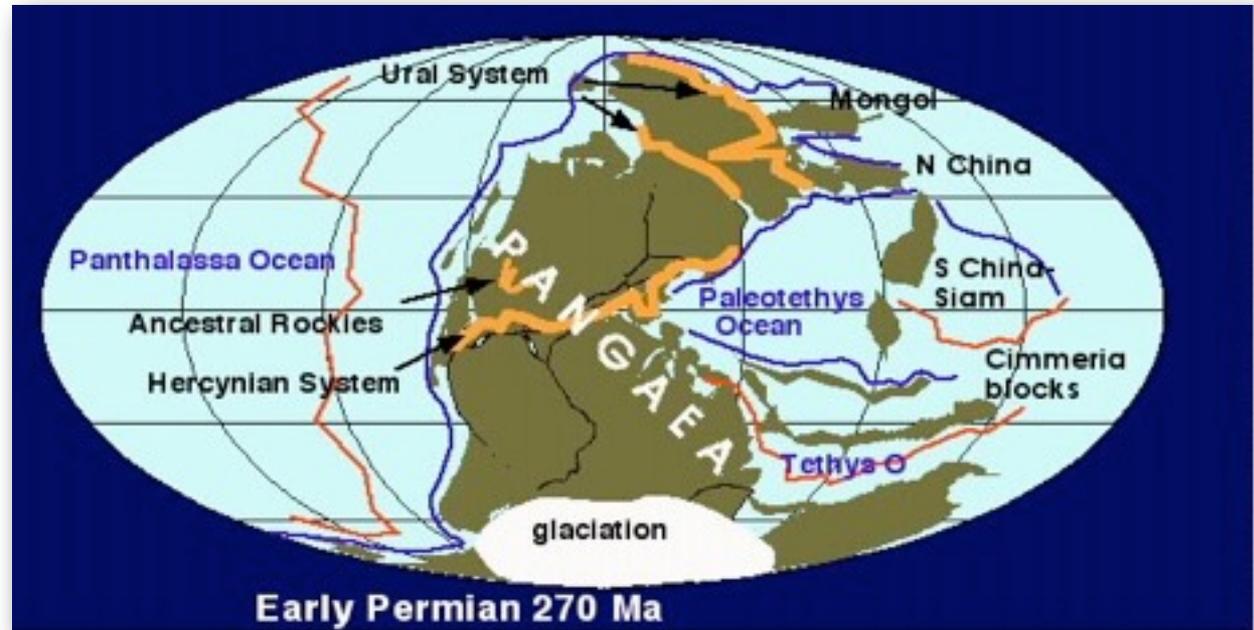
This mountain belt is ~300 million years old and represents the time when the continents collided to form the supercontinent Pangaea.



NASA

4. Paleoclimatic Evidence

Glacial deposits of the same age are found in southern Africa, South America, India and Australia — areas that it would be very difficult to explain the occurrence of glaciation.



Dr. R. Blakey at the Dept. of Geology, Northern Arizona University

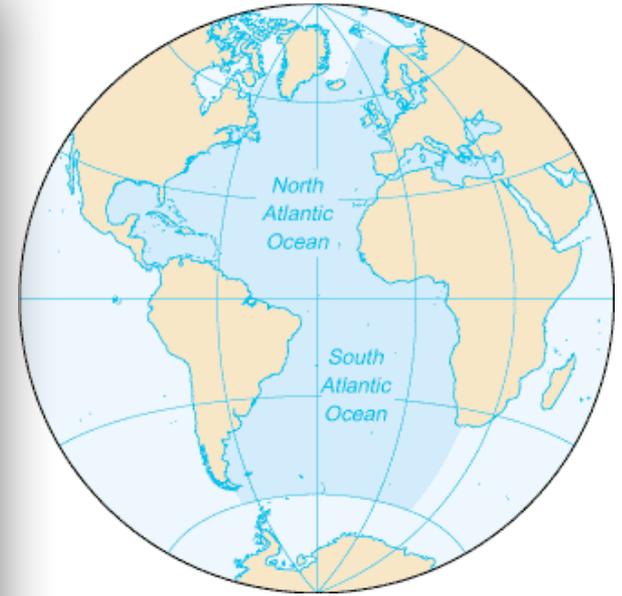
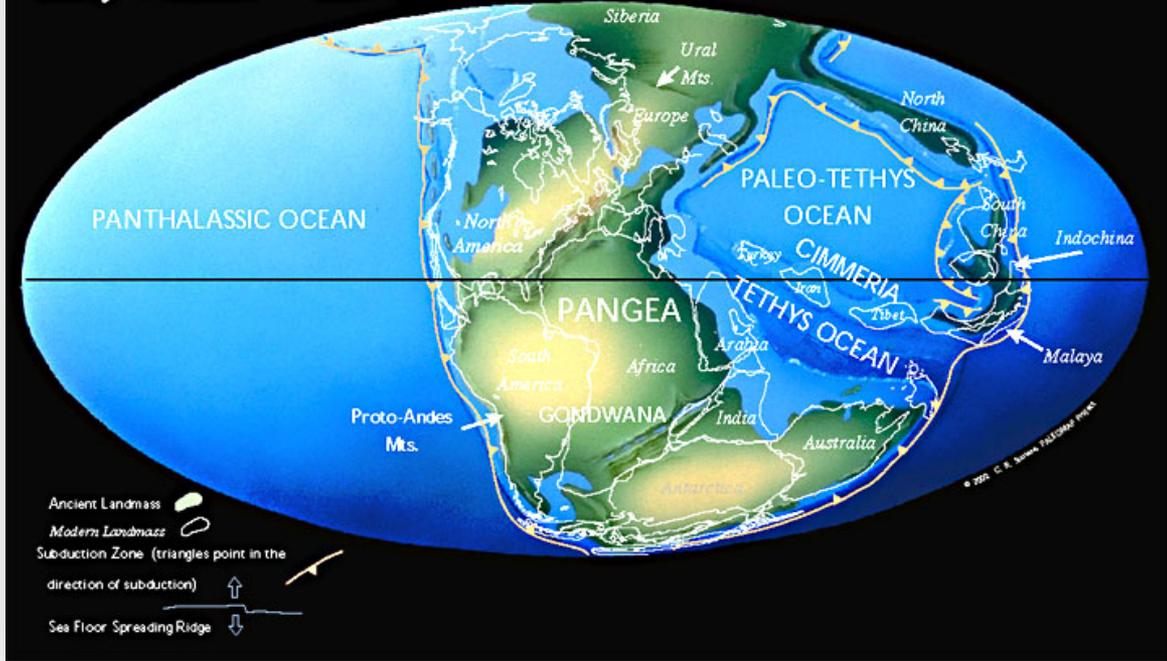
Pangaea with S. Africa centered over the South Pole could account for the conditions necessary to generate glacial ice in the southern continents.

At the same time, large coal deposits were formed from tropical swamps in N. America and Europe in regions that would have been equatorial.

How did the Atlantic Ocean form?



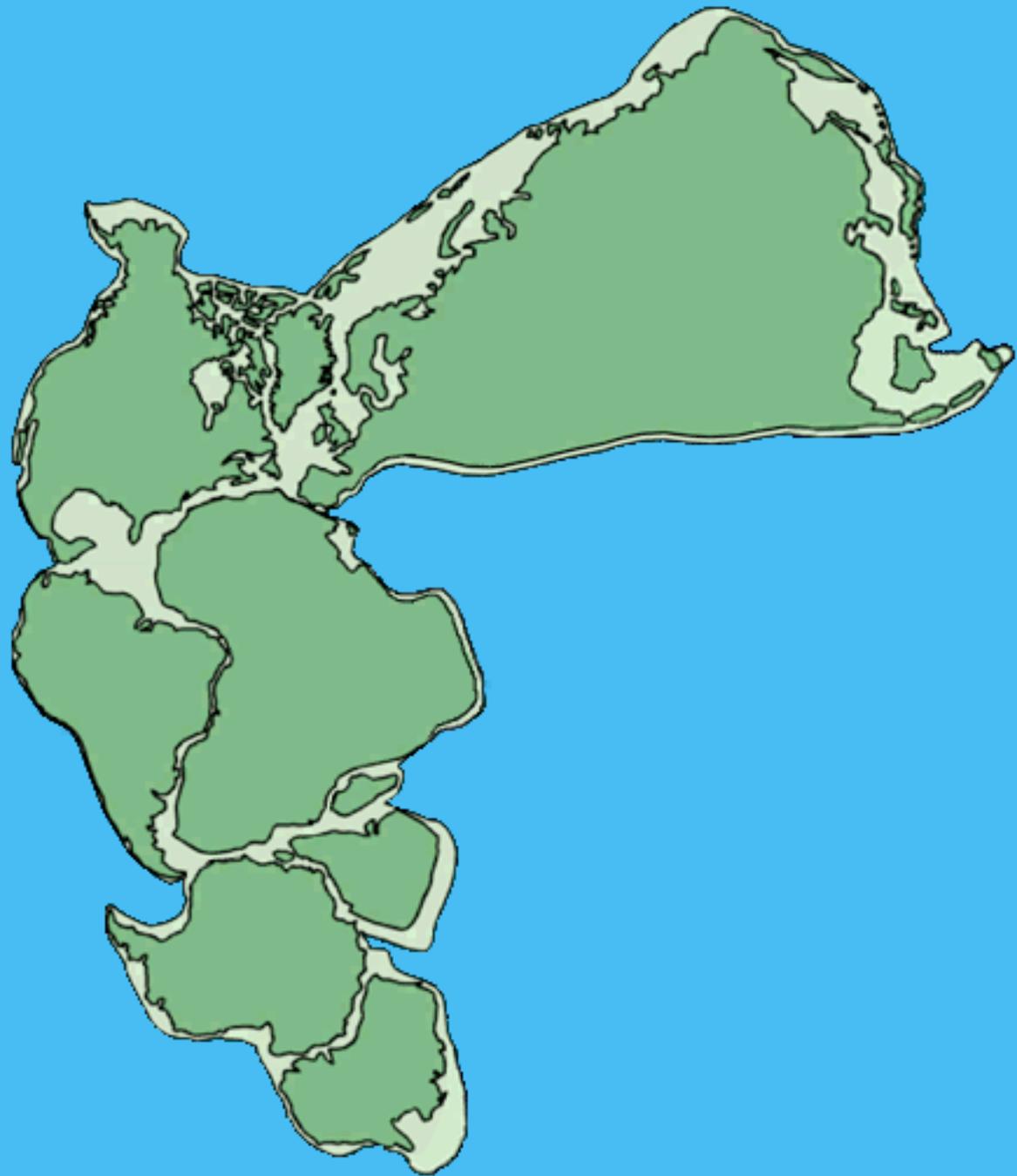
Early Triassic 237 Ma



[Paleomap Project](#)

Pangaea split apart forming smaller continents that moved into the locations that they are found today.

180
million
years
ago



How can you estimate the rate that the continents have been moving apart?

What information would you need to determine the rate that the continents are moving?

195 million years ago





<http://www.distancefromto.net/>

Science is based on more than mere *empirical* observation — we strive to understand the *mechanisms*.

We develop scientific theories to explain our observations.

Wegener's work may more correctly be an *hypothesis*.

It was not until the 1960's that further data led to the development of the *theory* of plate tectonics that could explain the movement of continents.

Wegener's idea of continental drift was not generally accepted because no one could come up with a reasonable mechanism for the movement of the continents.



Untold tragedies of continental drift.