Earth in Motion

Trace how new evidence changed an explanation of Earth's surface.

FSL.1.1 "Trace and model the historical development of scientific ideas and theories (e.g., atomic theory, plate tectonics, evolution, genetics, discovery of cells) through the development of a timeline."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each dated event in the passage, then number the events in time order. Circle the evidence or finding that led to each change in the explanation.

How Moving Continents Became Moving Plates

1. In 1912, German scientist Alfred Wegener proposed that today's continents had once joined in a single landmass, then drifted apart. He pointed to matching fossils on continents separated by oceans and to rock layers that lined up across their coasts. Even the shapes of some coastlines seemed to fit. Wegener called the former landmass Pangaea. Many scientists doubted his proposal because he could not show a convincing force that could move entire continents. His idea was not simply forgotten, however. It left a question that researchers could test: Were the continents fixed, or could Earth's surface move?

2. In the 1950s, ships using sonar mapped long underwater mountain chains, including the Mid-Atlantic Ridge. These maps revealed a raised seam running through the ocean floor, not a flat, motionless basin. In 1962, geologist Harry Hess proposed that hot material rises at such ridges and that new ocean crust forms there. As new crust moves outward, older crust travels away from the ridge. This process, called seafloor spreading, offered a possible way to move continents without pushing them through solid ocean crust. But Hess's explanation still needed evidence that the seafloor actually moved as he described.

3. In 1963, Frederick Vine and Drummond Matthews explained how magnetic stripes on both sides of ocean ridges could record seafloor spreading. When molten rock cools, its minerals preserve the direction of Earth's magnetic field. Reversals of that field produced matching stripe patterns as crust formed and moved outward. In 1965, J. Tuzo Wilson described transform faults, where sections of Earth's crust slide past one another, helping explain breaks between ridge segments. By the late 1960s, researchers joined these findings into plate tectonics: Earth's outer shell consists of moving plates that carry both continents and ocean floor.

2 ANSWER WITH EVIDENCE

Use the passage

1. What could Wegener explain in 1912, and what did Hess's 1962 proposal add to the explanation?

2. How did the 1950s sonar maps prepare the way for Hess's 1962 proposal?

3. Hess proposed seafloor spreading in 1962. What did Vine and Matthews add in 1963?

4. How did Wilson's 1965 work help build the plate tectonics explanation that took shape by the late 1960s?

3 YOUR TURN

Your own words

Build a six-step timeline from 1912 through the late 1960s. For each step, record a date or period, an observation or scientific finding, and how it changed the explanation of Earth's moving surface.

DATE OR PERIOD	OBSERVATION OR FINDING	CHANGE IN THE EXPLANATION

ANSWER KEY

Earth in Motion

HIGH SCHOOL · FSL.1.1

PART 1 · READ AND MARK

Underline each dated event in the passage, then number the events in time order. Circle the evidence or finding that led to each change in the explanation. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What could Wegener explain in 1912, and what did Hess's 1962 proposal add to the explanation?	**Wegener used evidence to propose that the continents had moved apart, but he lacked a convincing way they could move. Hess proposed seafloor spreading, in which new ocean crust forms at ridges and moves outward.**
2	How did the 1950s sonar maps prepare the way for Hess's 1962 proposal?	**The maps revealed underwater ridges. Hess proposed that new ocean crust forms at those ridges and moves outward.**
3	Hess proposed seafloor spreading in 1962. What did Vine and Matthews add in 1963?	**They explained how matching magnetic stripes on either side of ridges recorded crust forming and moving outward, providing evidence for seafloor spreading.**
4	How did Wilson's 1965 work help build the plate tectonics explanation that took shape by the late 1960s?	**Wilson described transform faults, which helped explain how parts of Earth's crust slide past one another. This finding became part of the explanation of moving plates.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

DATE OR PERIOD	OBSERVATION OR FINDING	CHANGE IN THE EXPLANATION
1912	Matching fossils and rock layers across oceans	Wegener proposed that once-joined continents had drifted apart.
1950s	Sonar maps revealed long underwater ridges	The ocean floor had features that a model of Earth's surface needed to explain.
1962	Hess proposed that new crust forms at ridges	Seafloor spreading offered a way for continents to move with ocean crust.
1963	Matching magnetic stripes lay on both sides of ridges	The patterns provided evidence that new crust moved outward.
1965	Wilson described transform faults	Sliding motion helped explain breaks between ridge segments.
Late 1960s	Researchers brought the findings together	Plate tectonics described moving plates carrying continents and ocean floor.

Accept equivalent wording and dates within the periods stated in the passage. Timeline entries should distinguish an observation or finding from its effect on the developing explanation.