

## Lab Activity: Maps Through Time and the Theory of Plate Tectonics

### Objectives:

- Students will make observations and analyze a series of world maps spanning the last 500 years to discover how our understanding of Earth's surface has changed over time.
- Through their observation, students will estimate the age of the maps, and compare them with a current understanding of the locations of earthquakes, volcanoes, and mountains.
- Students will connect geographic patterns to the development of the theory of plate tectonics.

### Materials:

- Printed or digital copies of world maps from:
  - Early 1400's Fra Mauro map of the world (**map 3**)
  - Two maps from the mid 1700's (**maps 1 and map 4**)
  - 1800s (volcanic observations and mountain chains) (**maps 3, 6, and 6a**)
  - Heezen/Tharpe map (**map 5**)
  - Earthquake distribution (current) (**map 7**)
  - Volcano distribution (current) (**map 7**)
  - Major mountain ranges (current) (**map 8**)
- Student lab sheet (for observations, questions, and conclusions)

## Procedure:

### 1. Map Observation (Historical Progression):

- In groups, students will examine each historical map.
- For each, they will:
  - Record **at least 5 observations** (shape of continents, missing areas, distorted land, size of oceans, unknown regions, how the ocean floor is shown).
  - Estimate **when the map was made** and explain their reasoning.
  - Ask **at least 2 questions** about what the mapmakers did not know yet.

### 2. Pattern Recognition (Modern maps of earthquakes/volcanoes and mountain chains):

- Once students reach the 20th century and modern maps, they will compare the current maps of :
  - Earthquake zones
  - Volcano distribution (Ring of Fire, mid-ocean ridges)
  - Mountain ranges (Himalayas, Andes, Rockies, Alps)
- Students will record **at least 5 observations** about these patterns.

### 3. Connecting to Plate Tectonics:

- Students answer guiding questions:
  - What do the patterns of earthquakes, volcanoes, and mountains suggest about Earth's surface?
  - How does this evidence support the idea that the continents are moving?
  - How might early mapmakers have reacted to the idea of moving continents?

#### 4. Reflection and Conclusion:

- Students write a short response:
  - How has the accuracy of maps changed over time, and what does that tell us about human understanding of Earth?
  - How do geographic patterns provide evidence for plate tectonics?

#### Guiding Questions for Students:

- What features on early maps show that people didn't yet understand the full shape of continents and oceans?
- Do any continents look like they might "fit together"? Where?
- Where are most volcanoes located on the modern map? Earthquakes? Mountains?
- How do these patterns connect to the edges of continents and oceans?
- Why did it take so long for scientists to accept the idea of moving continents?

#### Assessment:

- Participation in group map analysis
- Completed lab sheet with observations, questions, and reasoning
- Written conclusion connecting map development and plate tectonics

## Lab Activity: Maps Through Time and the Theory of Plate Tectonics

### Objective:

You will analyze a series of world maps from the last 500 years to discover how our understanding of Earth has changed. You will also compare modern earthquake, volcano, and mountain data to help explain the development of the **theory of plate tectonics**.

### Part 1: Historical Maps

**Directions:** Look carefully at each map provided. For each, record your observations, estimate the age of the map, and write down questions. Some things to look at: shape of continents, missing areas, distorted land and coastlines, size of oceans, unknown regions, how the ocean floor is shown. Use the data table below to record your observations.

Map #	Observations (5)	Questions (2)	Age estimate and reason
1	1. 2. 3. 4. 5.	1. 2.	
2	1. 2. 3. 4. 5.	1. 2.	

<b>Map #</b>	<b>Observations (5)</b>	<b>Questions (5)</b>	<b>Age estimate and reasoning</b>
<b>3</b>	1. 2. 3. 4. 5.	1.  2.	
<b>4</b>	1. 2. 3. 4. 5.	1.  2.	
<b>5</b>	1. 2. 3. 4. 5.	1.  2.	
<b>6 a and b</b>	1. 2. 3. 4. 5.	1.  2.	

## **Part 2 Pattern Recognition (Modern maps of earthquakes/volcanoes and mountain chains)**

Look at the maps including the current maps showing earthquakes/volcanoes and mountain chains. Answer the following questions:

1. How do the historical maps compare to the current maps of earthquakes and volcanoes? Look at where the earthquakes and volcanoes are located both on the continents and the ocean floor, is this the same on the older maps and current maps?
  
2. Look at the distributions of mountain chains, how do the older maps compare to the current maps? Are they in the same place? Do you see mountain chains on the earlier maps that don't show up on the current maps?

## **Part 3: Connecting to Plate Tectonics:**

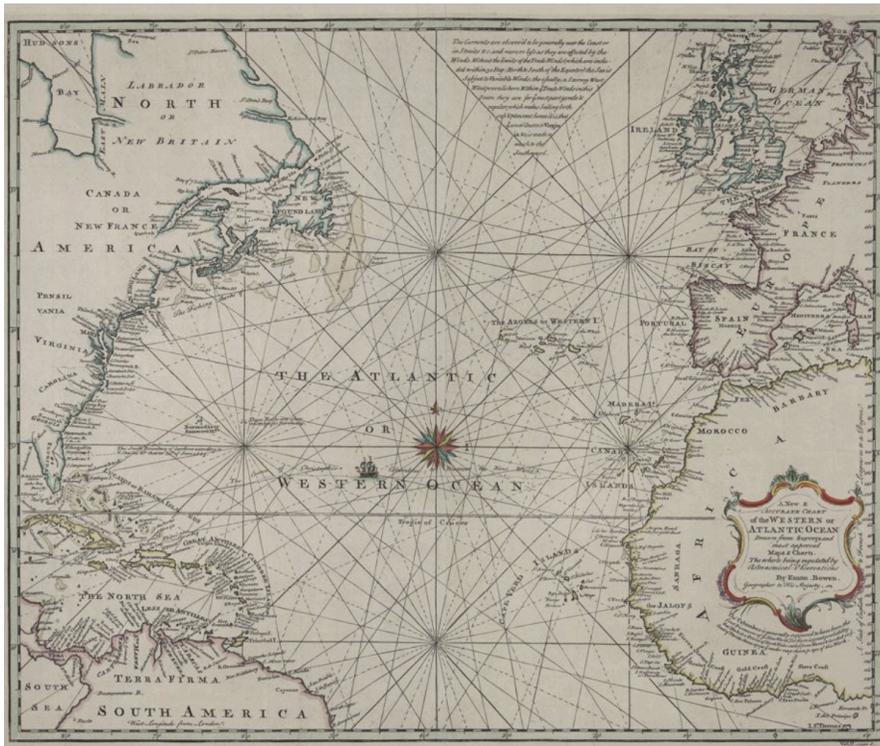
1. What do the patterns of earthquakes, volcanoes, and mountains suggest about Earth's surface?
  
2. How does this evidence support the idea that the continents are moving?
  
3. How might early mapmakers have reacted to the idea of moving continents?

#### **Part 4: Reflection and Conclusion:**

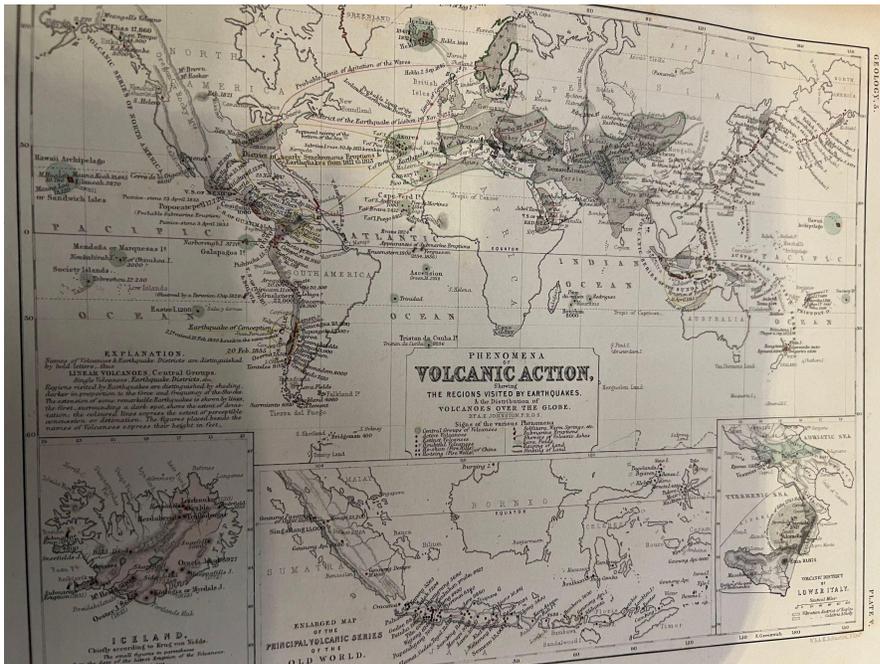
Write a paragraph addressing the following:

- a. How has the accuracy of maps changed over time, and what does that tell us about human understanding of Earth?
- b. How do geographic patterns provide evidence for plate tectonics?

Map 1 (1748)



Map 2 (1850's)



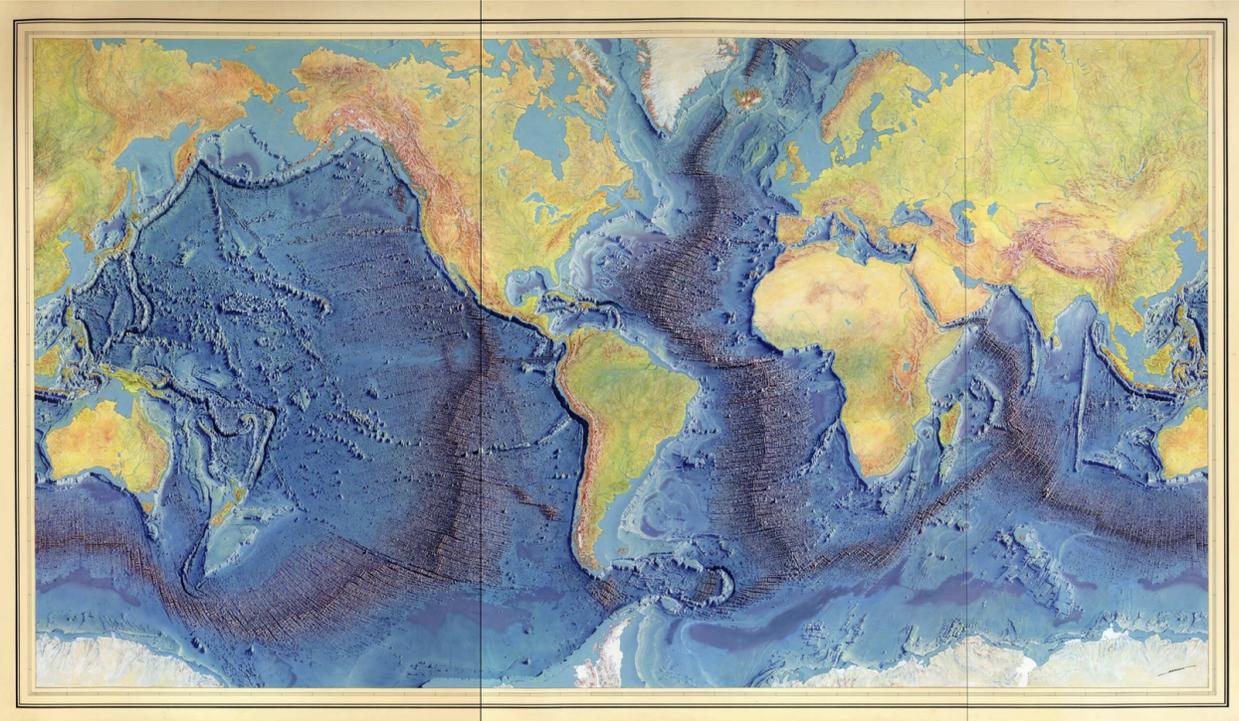
Map 3 (1400's)



Map 4 (1768)



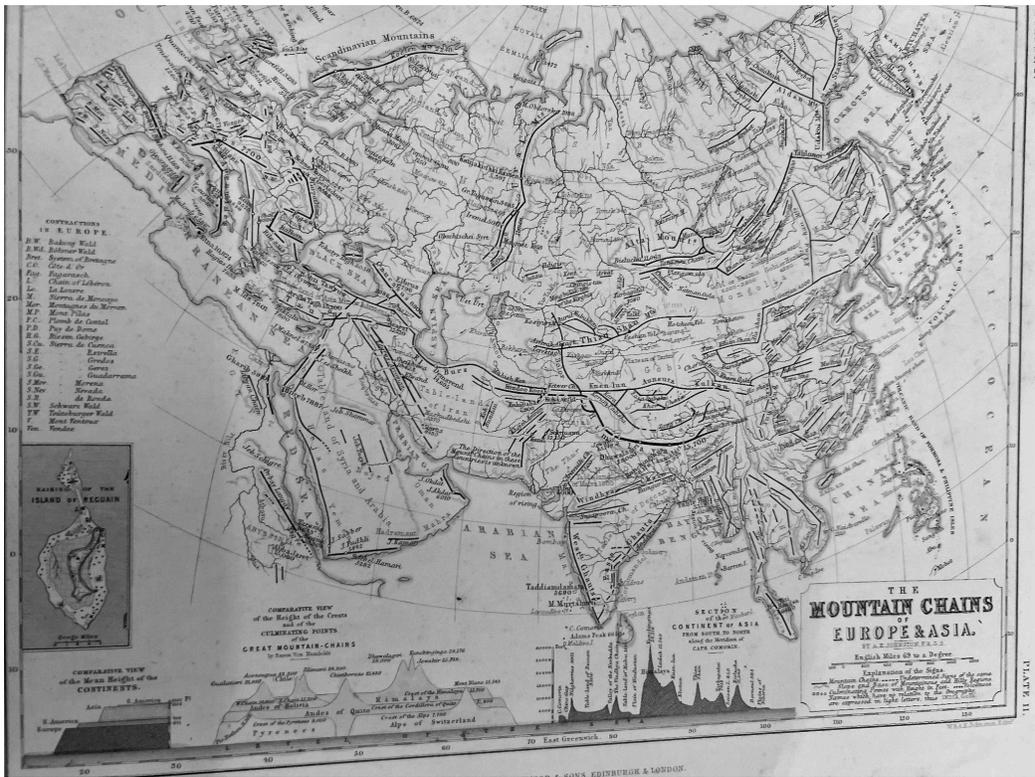
Map 5 (1950's)



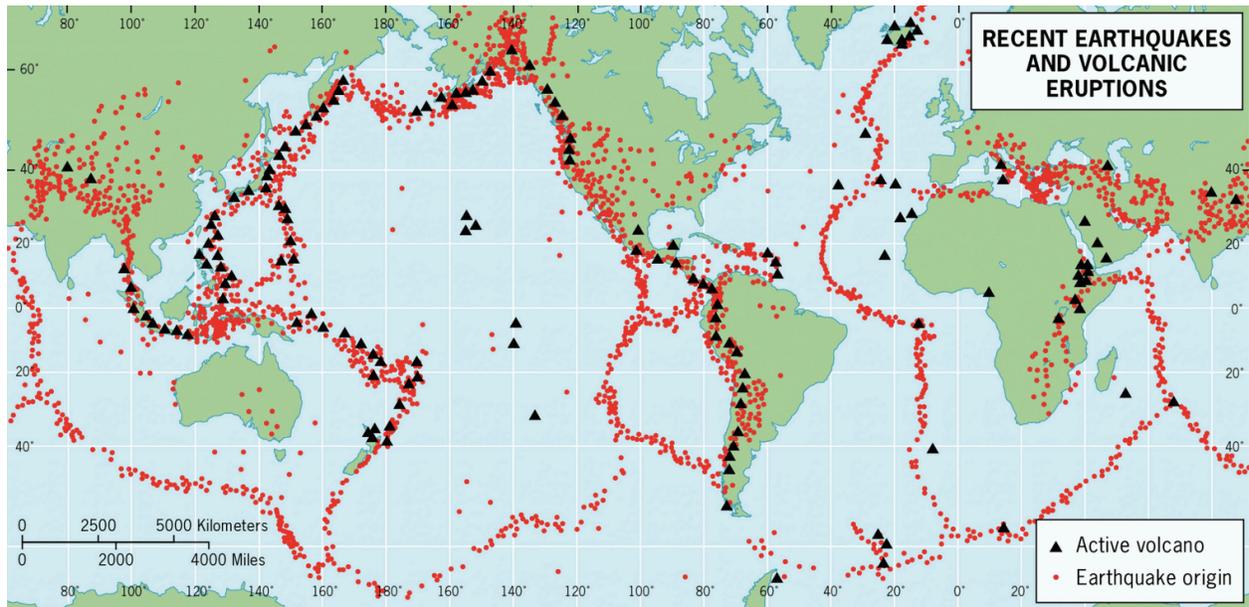
Map 6 (1850's)



Map 6a (1850's)



Map 7



Map 8

