DISCOVERING THE WALLACE LINE

INTRODUCTION

Alfred Russel Wallace (1823–1913) was a naturalist and a contemporary of Charles Darwin. As a young man, he became intrigued with the idea that species arise from earlier forms. He conducted two expeditions to collect specimens and to research where species come from. The first expedition, a four-year trip to the Amazon, ended in disaster when his ship caught fire and sank, taking his entire collection with it. Undaunted, Wallace mounted his second expedition in 1854, this time to the Malay Archipelago. He spent 8 years exploring the islands, and it was during this time that he described the phenomenon of natural selection. After returning to England, Wallace continued his work and made many important contributions in fields including politics, geodesy, glaciology, and planetary science.

In this activity, you will walk in Wallace's footsteps as you investigate the animals that live in the Malay Archipelago and explore how those observations contributed to the theory of evolution by natural selection.

PROCEDURE

Part 1: Field Studies

Use the attached map (page 7) and pages from a "field notebook" (pages 4-6) to complete the steps below and answer the questions in steps 2 and 4.

1. For each type of animal listed below, draw a boundary on the map that includes all the locations where specimens of that animal have been found. Use different colors or patterns to distinguish the lines for each order.

	Latin Family	Common
A.	Cacatuidae	Cockatoos
B.	Cercopithecidae	Old World Monkeys
C.	Felidae	Cats
D.	Macropodidae	Kangaroos
E.	Megapodiidae	Mound-Building Birds
F.	Meliphagidae	Honeyeater Birds
G.	Paradisaeidae	Birds-of-paradise
H.	Picidae	Woodpeckers
I.	Ursidae	Bears
J.	Petauridae	Possums

2. What pattern emerges from the lines that you have drawn? Can you identify any groupings?

3. If you can, draw a boundary line that separates different faunal assemblages.

4. Given that these islands have similar climates and habitats, suggest an explanation for why some islands have similar fauna while nearby islands have completely different fauna.

Now watch the film *The Origin of Species: The Making of a Theory*. After watching the film, complete steps 5 and 6 below.

Part 2: Considering Continental Movement and Sea Level Change

View the two supplemental animations and/or examine the attached figures that show how sea level and the continents have changed over time.

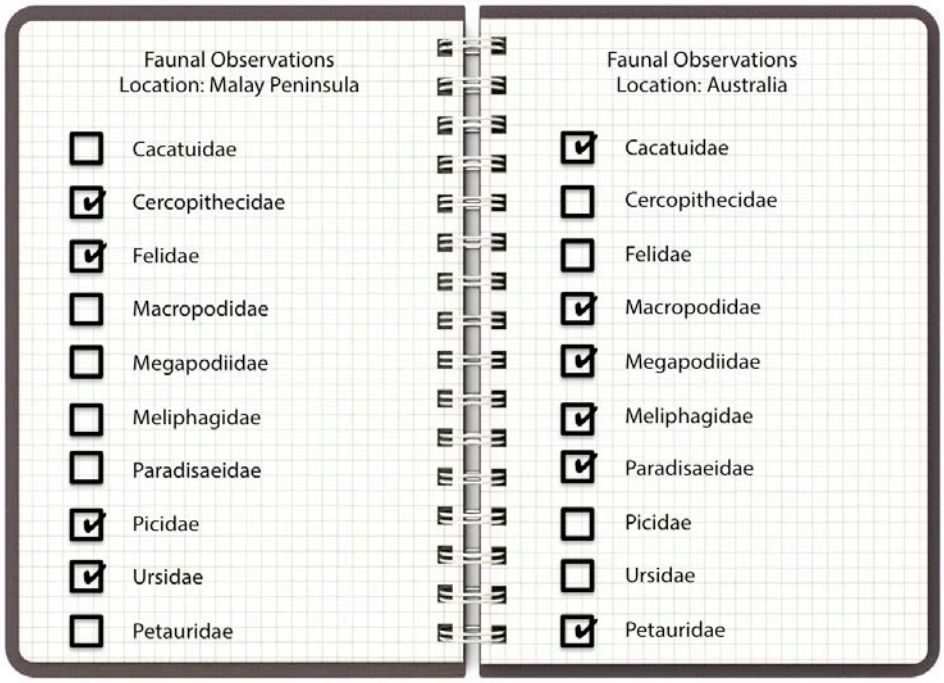
5. Evaluate the boundary line you drew for step 3. If, based upon the new information you've learned, you need to change your boundary line, do so now.

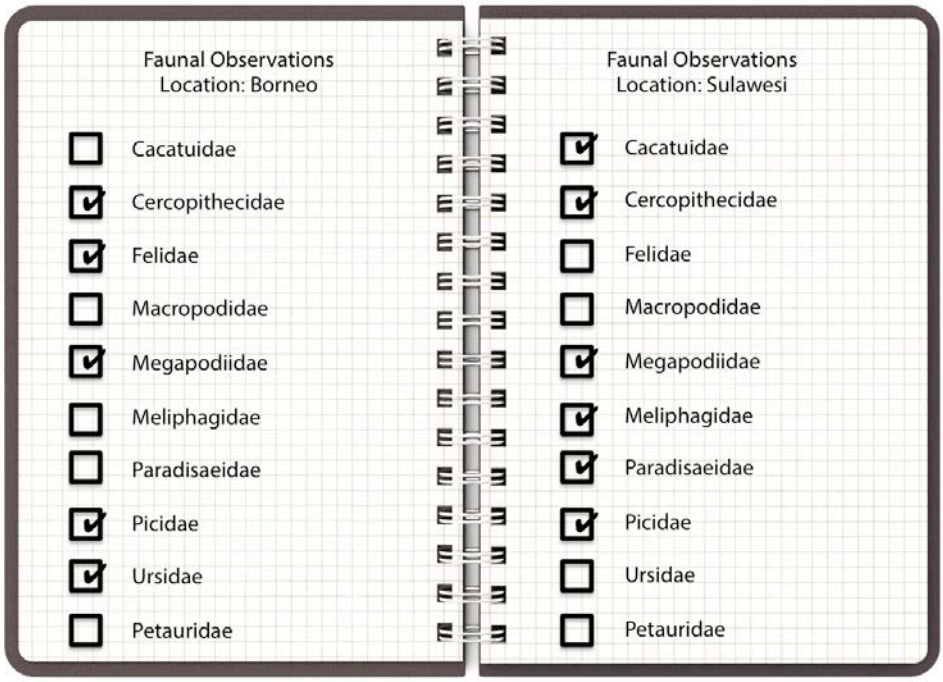
6. Use the figures and what you learned in the film to elaborate on the explanation that you wrote in question 4.

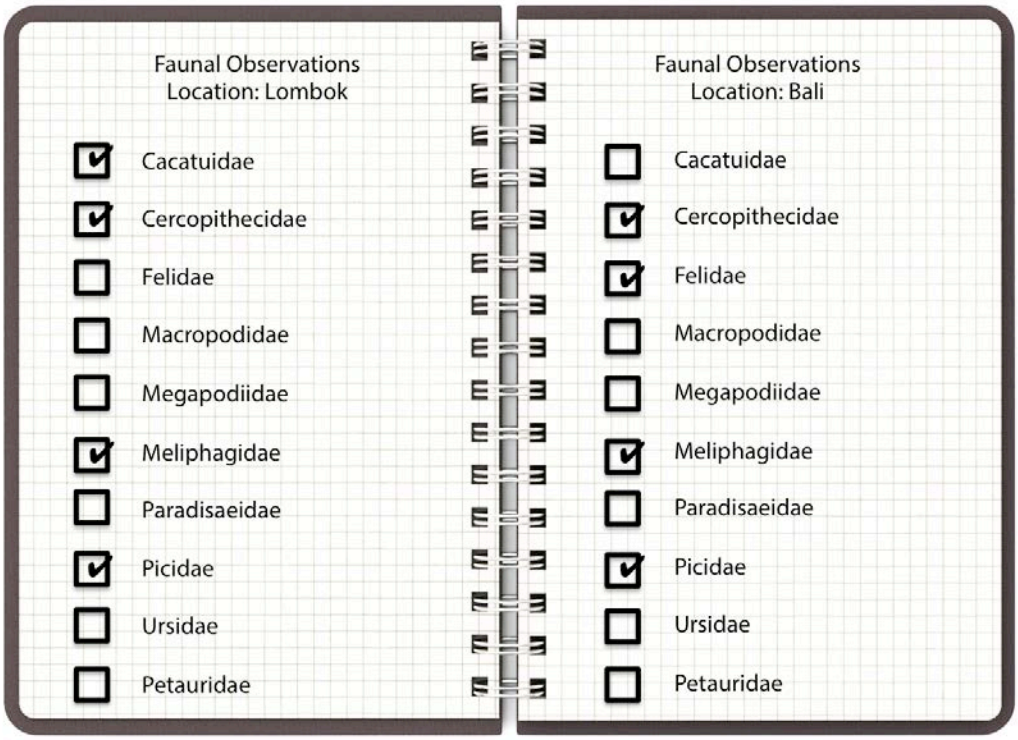
AUTHORS

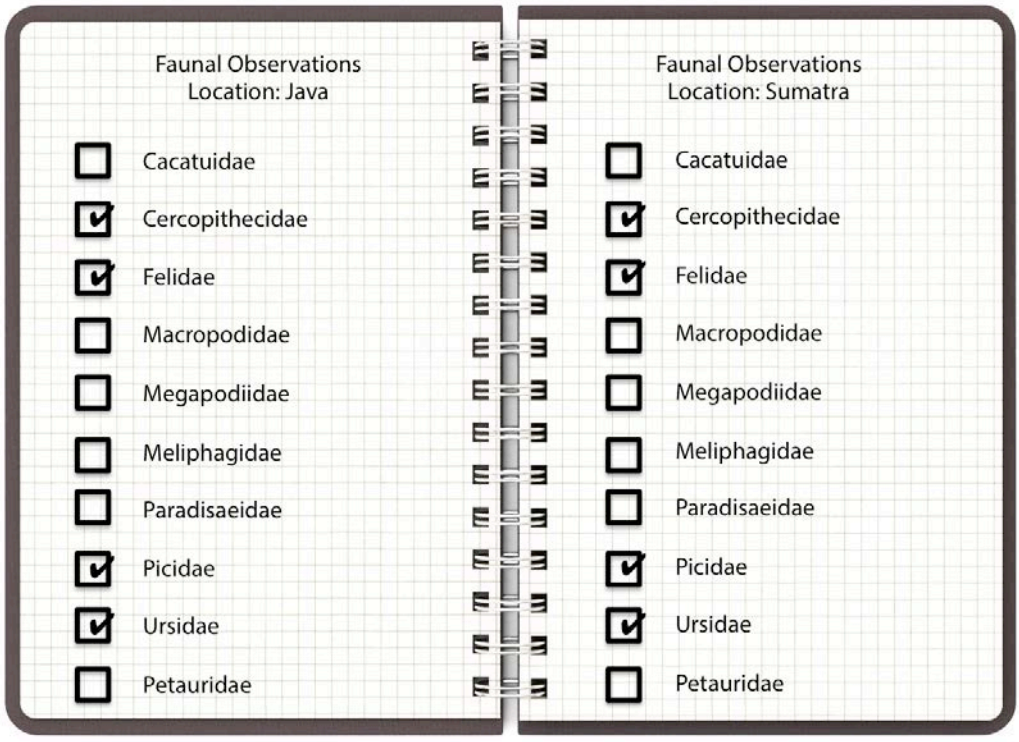
Written by Mark Nielsen, PhD, HHMI and Jeremy Conn, Mason City Schools, OH
Edited by Susan Dodge and Laura Bonetta, PhD, HHMI; copyedited by Linda Felaco
Reviewed by Dan Exton, PhD, Operation Wallacea

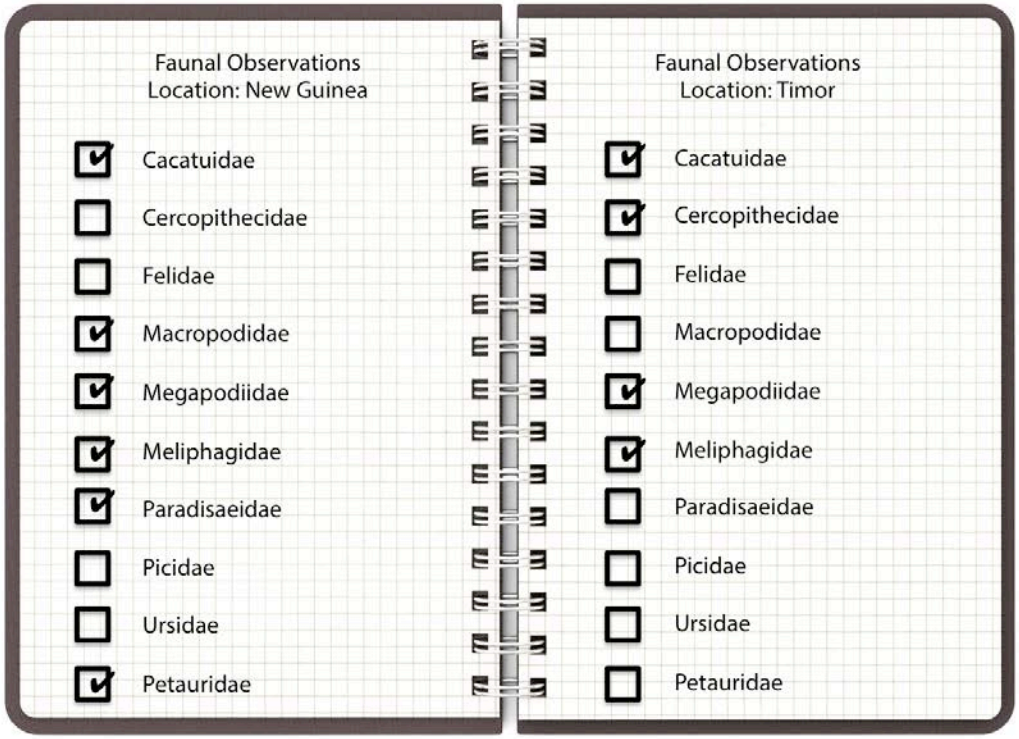
FIELD NOTEBOOKS



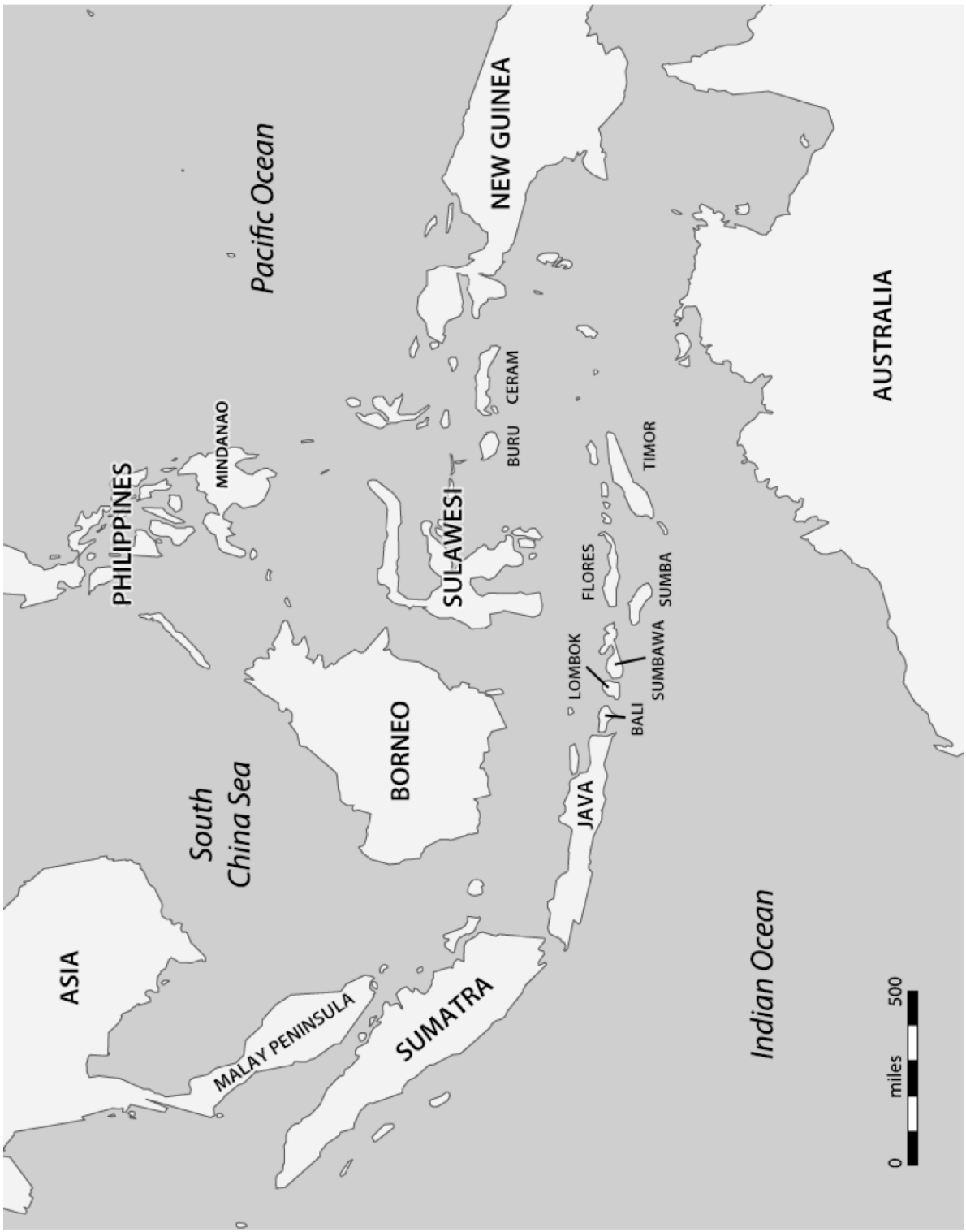



Faunal Observations
Location: Lombok
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae
Faunal Observations
Location: Bali
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae


Faunal Observations
Location: Java
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae
Faunal Observations
Location: Sumatra
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae

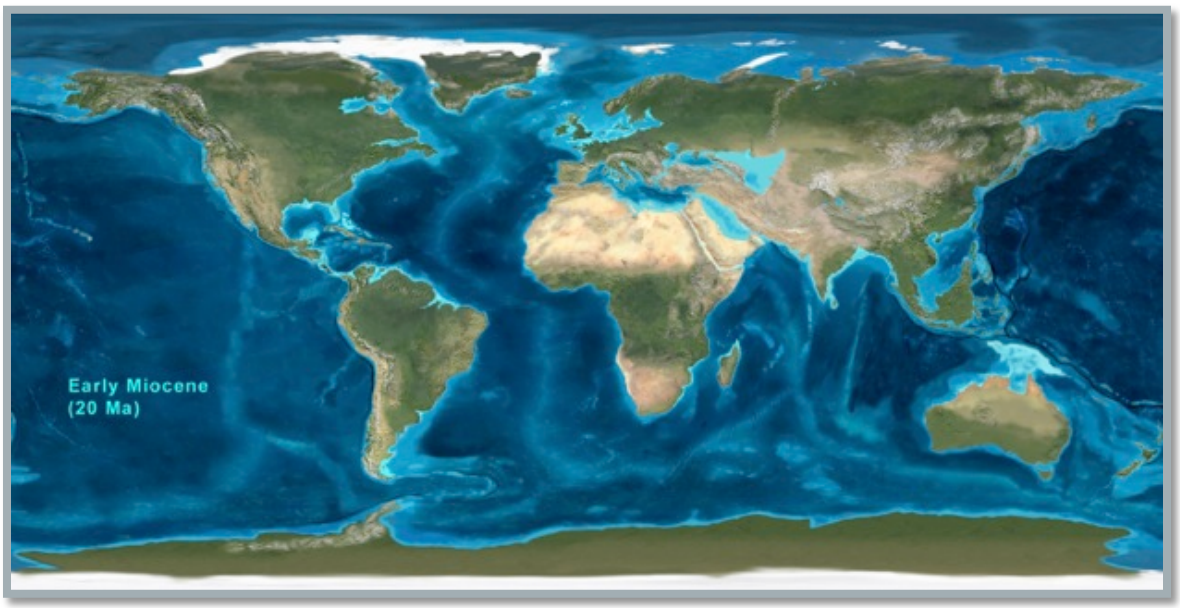

Faunal Observations
Location: New Guinea
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae
Faunal Observations
Location: Timor
Cacatuidae
Cercopithecidae
Felidae
Macropodidae
Megapodiidae
Meliphagidae
Paradisaeidae
Picidae
Ursidae
Petauridae

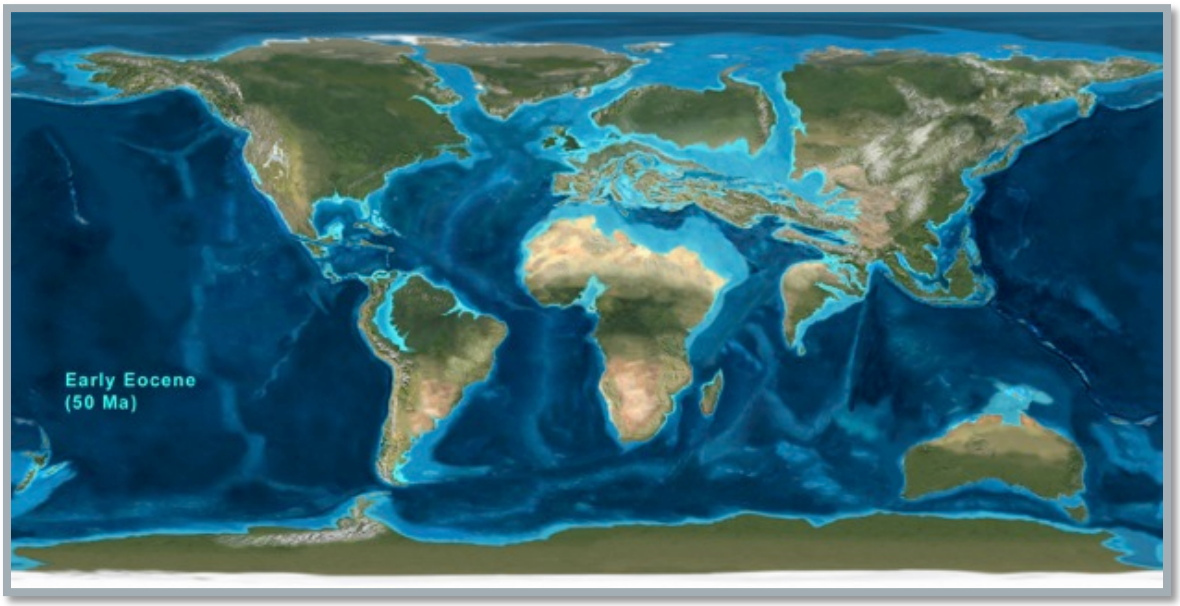
MAP

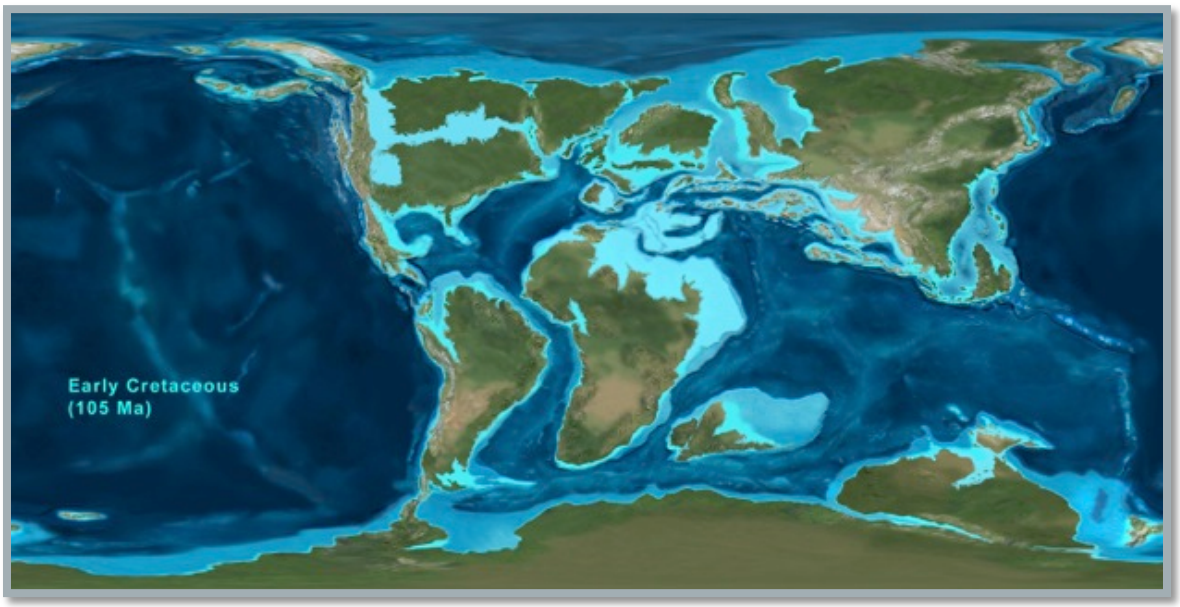

Pacific Ocean
NEW GUINEA
AUSTRALIA
CERAM
BURU
MINDANAO
PHILIPPINES
SULAWESI
TIMOR
FLORES
SUMBA
LOMBOK
SUMBAWA
BALI
BORNEO
JAVA
South China Sea
ASIA
MALAY PENINSULA
SUMATRA
Indian Ocean
0
miles
500

CONTINENTS MOVE OVER TIME

Earth's continents are in constant movement because of plate tectonics. Although the movements are slow, the continents have moved vast distances over periods of millions of years. The maps below show reconstructions of Earth's surface over the last 105 million years. Notice how Australia and its islands were once separated from Asia by an ocean as wide as the modern Atlantic.




Early Eocene
(50 Ma)

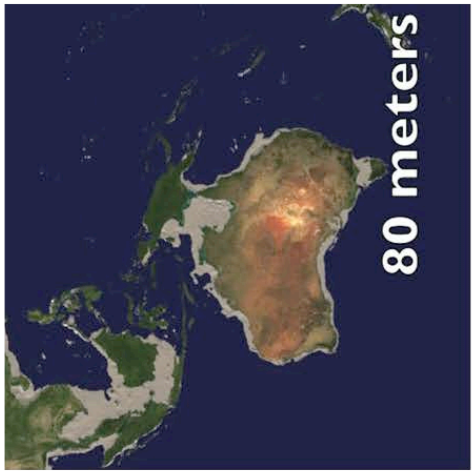

Early Cretaceous
(105 Ma)

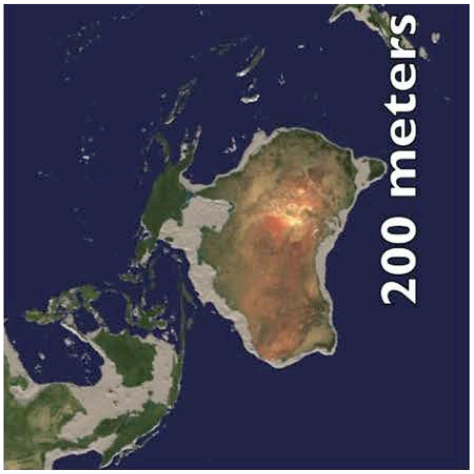
CHANGES IN SEA LEVEL

The following figures show how the shape of land changes as sea level changes. The gray areas around continents and islands represent the area that would be exposed as land if the sea level were to drop the amount indicated on the maps.

Sea level fluctuates based on the amount of water that is contained in ice; the amount of ice has increased and decreased throughout geologic history. When the volume of ice is high, sea level is low because the water is trapped in the ice. Conversely, when the ice melts, sea level rises. The last ice age was about 20,000 years ago, and sea levels may have been as much as 200 meters below what they are today.

Using a map of underwater depth, scientists can reconstruct what the continents looked like during the last ice age when sea level was much lower.





Maps courtesy of NOAA