Name: _____ Date: _____

Seven Is a Choice

Reading level 13 · 1483 words

In 2017 a team of eleven geologists, led by Nick Mortimer, made an odd claim in print. A stretch of the southwest Pacific covering about 4.9 million square kilometers, roughly the area of greater India, is not a scatter of islands and sunken ridges. It is a continent, and they called it Zealandia. About 94 percent of it lies under the sea, and New Zealand and New Caledonia are just its high ground. If you learned in school that there are seven continents, the paper raises an awkward thought. Perhaps the number was never a measurement of the planet at all, but a choice. To see why, it helps to pull apart two questions that the word continent blends together: what people have agreed to call one, and what the rock itself is doing.

Start with the agreed answer. By custom, continents are large, unbroken masses of land, ideally set apart by wide stretches of water. Very little of that survives contact with a real map. "Large" is arbitrary. Greenland, at about 2.17 million square kilometers, is called the world's largest island, while Australia, at about 7.62 million, is a continent, and nothing in nature marks the line between them. "Set apart" fares even worse. North and South America meet at Panama, and Africa meets Asia at a narrow neck of land in Egypt. Europe and Asia are not split by water at all, since they form one landmass, Eurasia, and the border between them is an imaginary line that runs from the northern Ural Mountains south to the Caspian and Black Seas.

Because the rules are loose, different places have settled them in different ways. Most English-speaking countries teach seven continents, including the United States, Canada, the United Kingdom and Australia, and so do China, India and the Philippines. Greece and many countries that speak Romance languages, such as Spanish or Portuguese, teach six, with one America; much of Latin America counts this way. Russia and parts of Eastern Europe mostly use a different six, with Eurasia as one. The five rings of the Olympic flag stand for the five continents where people live, leaving out Antarctica. Count only joined land and you reach four: Afro-Eurasia, America, Antarctica and Australia. None of these is a mistake. Each one is consistent with itself. Each simply weighs the loose rules its own way, the way two referees might call the same close play differently.

Even the American seven is younger than most people think. From the middle of the 1800s, maps printed in the United States more often showed North and South America as two continents, while European maps usually joined them. Yet it was still not unusual for an American atlas to show one America until the 1940s. Only from the 1950s did most geographers in the United States split it in two. The split between Europe and Asia draws sharper criticism. Some scholars see it as a leftover of Eurocentrism, a way of seeing the

world with Europe at its center. The historical geographer Martin W. Lewis has argued that our lists of continents grew more out of social, political and cultural history than out of geology. A continent, in this view, is partly an idea about people.

Geology asks a different question, and it gets a sharper answer. Geologists generally agree that a continent has four traits. It stands high above the ocean floor, and it holds a wide range of rocks rich in silica, much of it granite. Its crust is thicker than ocean crust, and earthquake waves travel through it more slowly. And it has clear edges around a large enough area. The key is the crust. Continental crust is usually 30 to 46 kilometers thick, while ocean crust is about 7. Continental crust is also less dense, so it floats higher on the heavy mantle below. Both differences push the same way, much as a thick block of pine rides higher in water than a thin slab of oak. That is why continents stand as broad, high platforms, with the oceans lying in deep basins between them.

The difference in density has a second result: continents are old. Where two plates push together, heavy ocean crust is forced down under lighter continental crust and melted in the mantle's heat. So the ocean floor is always being destroyed and made again. Continental crust floats too well to sink, so it piles up and stays. As a result, continental crust is far older than the ocean floor. Stand on the oldest part of the Canadian Shield and you are standing on rock that formed more than 3.5 billion years ago. Seen this way, the continents are the planet's long record, the parts of the surface that the moving ocean floor has never managed to swallow. It is a strange thought. The floor of the Atlantic is young, while the ground under a quiet field in Canada is ancient.

Held up against those four traits, Zealandia does surprisingly well. It stands high above the ocean floor around it, and it holds the right mix of rocks rich in silica. It is about six times the size of Madagascar, far too big to wave away as a stray chip of a continent. Its crust is mostly 10 to 30 kilometers thick. That is thinner than a typical continent, but everywhere thicker than the roughly 7 kilometers under the ocean basins. The authors call it the youngest, thinnest and most sunken of the continents. The name itself was first suggested by the geologist Bruce Luyendyk in 1995. Not everyone accepts the promotion. Some geologists objected that no very ancient core rock had been found there. Then a 2021 study reported that part of the sunken continent is that old after all.

The deeper reason no count can be final is that the pieces move. As early as 1596, the Dutch mapmaker Abraham Ortelius suggested that the Americas had been torn away from Europe and Africa. The idea became a full scientific theory in 1912, when Alfred Wegener, a 32-year-old German weather scientist, proposed what he called continental drift. Part of his evidence was the striking fit of the coasts of South America and Africa, and part was the fossils on both sides of the Atlantic. The reptile Mesosaurus, for instance, turns up in southern Africa and in Brazil and Uruguay, and nowhere in between. That is an odd pattern for a slow swimmer of shallow coastal lagoons, unless those two coasts were once a single shore.

On two points, Wegener's critics were right. He could not explain what force might move a continent. His guess that continents plowed through the ocean floor was answered by the English geophysicist Harold Jeffreys, who argued, correctly, that solid rock would break up before it could do that. His estimate of their speed, about 250 centimeters a year, was also about a hundred times too high. The accepted rate for the widening Atlantic is closer to 2.5 centimeters a year. It did not help that he was not a geologist, and he did not live to see his idea accepted. The rescue came from the sea floor. Between 1959 and 1963, several researchers saw that the magnetic rock of the ocean floor lies in stripes like a zebra's. These stripes are a record of new crust spreading outward from ridges in the middle of the ocean.

Today the motion is not guessed but measured. Satellites track the crust to within a fraction of a millimeter a year, and the plates turn out to move at roughly the speed your fingernails grow. Run that motion backward and the continents gather into Pangaea, a name built from Greek words for "all" and "Earth." Wegener used the name just once, in the 1920 edition of his book. Even its dates are in dispute. One summary has it forming about 335 million years ago and breaking up about 175 million years ago. The US Geological Survey puts the start of the breakup at 225 to 200 million years ago. And the question Wegener could not answer, what exactly drives the plates, is still argued over today.

So how many continents are there? By custom, seven in many classrooms, and six or five or four in others. By crust, there is a twist worth savoring. Count the continents the way a geologist does, treating Eurasia as one and letting Zealandia in, and you arrive at seven again: Africa, Antarctica, Australia, Eurasia, North America, South America and Zealandia. It is the same number, but a different list, reached by an entirely different argument, and neither count will last. Africa is already splitting in two along the Great Rift Valley, and the plates may one day crowd the land into another supercontinent. Any answer is a snapshot taken partway through a very slow film. The most honest reply begins with another question: counted how?

Questions

1. Why does the essay say the usual definition of a continent fails on a real map?

A. Maps are drawn wrong
B. There are too many oceans
C. Continents are not clearly large or separate, so people must decide

2. What makes continental crust float higher than oceanic crust?

A. It is thicker and lower in density
B. It is hotter
C. It is made of ice

3. Why did many scientists reject Wegener's idea at first?

A. He had no maps
B. He could not explain what force moved the continents
C. He said the Earth was flat

4. In the essay, what does "sunken" mean when it describes Zealandia?

A. Very old
B. Covered by the sea
C. Split into pieces

5. What is the twist in the geological count of continents?

A. It also reaches seven, but with a different list
B. It finds only two
C. It agrees exactly with school maps

6. Why is continental crust much older than the ocean floor?

A. It formed later
B. Oceanic crust sinks and is recycled, while continental crust stays on top
C. Rain protects it

Words to know

custom: agreed habit
crust: outer rock layer
density: heaviness for size
sunken: underwater
geophysicist: Earth physicist
supercontinent: all land joined

Answer key: Seven Is a Choice

1. C. Continents are not clearly large or separate, so people must decide
2. A. It is thicker and lower in density
3. B. He could not explain what force moved the continents
4. B. Covered by the sea
5. A. It also reaches seven, but with a different list
6. B. Oceanic crust sinks and is recycled, while continental crust stays on top