

UNIT 4

BEFORE YOU READ

Read these questions. Discuss your answers in a small group.

1. Find the African countries of Eritrea, Ethiopia, and Djibouti on a map. What do you know about these countries or this area of the world?
2. On the map of Africa, what geological features indicate where a tear might be located on the Earth's crust?
3. How do oceans form?

READ

This online newspaper article examines a major geological event occurring in East Africa.

An Ocean Waiting to Happen

The nomads¹ were terrified. For a week in September of 2005, the ground shook violently. Cracks opened up in the soil, swallowing goats and camels. Smoke rose out of the dark splits in the ground. After retreating to the hills, the nomads saw chunks of glassy rock burst randomly through the Earth's crust "like huge black birds" and fly almost 100 feet into the air. A mushroom cloud of ash dimmed the sun for three days. At night the new crater² breathed flashes of fire.

"They had experienced earthquakes before but never anything like this," said Atalay Ayele, a scientist at Addis Ababa University, who interviewed the Afar tribespeople in this isolated corner of northeastern Ethiopia. The Afar community explained it by saying God was angry with them.

Dr. Ayele and his colleagues knew the area was geologically unstable, but the number of strong earthquakes was exceptional. There were 162 quakes measuring more than 4 on the Richter scale³ in just two weeks—a quake measuring 5 on the scale releases as much energy as the nuclear explosion

that destroyed Hiroshima in World War II. All this made Ayele's team suspect that something extraordinary had happened deep underground.

30 When satellite data for the region became available, they showed that huge forces had just transformed East Africa. Here in the Afar desert, one of the hottest and driest places on Earth, a new ocean was evolving. For the 35 first time, observation of an event of this sort was possible, aided by a satellite. Images from the European Space Agency's Envisat satellite showed that a huge rift, 40 miles (64 kilometers) long and up to 26 feet (8 meters) wide, had 40 opened deep in the Earth's crust. The tear was created by a violent upsurge of molten rock. This magma pushed in along a break where two plates of the Earth's crust meet. The magma displaced both plates, pushing them aside and apart. 45 Tim Wright, a geologist at the University of Leeds who interpreted the satellite results, was astonished by the images and what they pointed to. "The process happening here is identical to that which created the Atlantic Ocean," he said. 50 "If this continues we believe parts of Eritrea, Ethiopia, and Djibouti will sink low enough to allow water to flow in from the Red Sea."

¹ *nomad*: a member of a community that moves seasonally and has no permanent home

² *crater*: a large hole in the ground formed by natural processes

³ *Richter scale*: the unit of measurement for earthquakes

Teams from the United Kingdom, France, Italy, and the United States have mounted 55 expeditions to Afar. This is the region described by the explorer Wilfred Thesiger in the early 20th century as a “land of death.” Satellites now give comprehensive views of what he meant. From above, you can see vast, rigid, black 60 tongues of cooled lava reaching out into the desert sands. Rust-colored volcanoes stand open and gaping, their lids blown off. There are so many fissures⁴ and faults⁵ where the ground has opened and slipped that the Earth’s skin looks 65 like elephant skin.

The moon-like geography reflects what lies beneath. Afar stands at the junction of three tectonic plates, which meet at unstable fault lines. The Nubian and Somali plates run 70 along the Great Rift Valley. The Arabian plate branches out to the north. The boundaries of these plates continually fluctuate as the upwelling of magma underneath pushes them around.

75 Earth’s tectonic plates are constantly shifting—usually by only a few centimeters a year. Adjacent plates can slide past one another, as occurs along the San Andreas Fault, in California. The plates can also collide. India’s 80 collision with the landmass to the north started its integration with the Eurasian continent. This process forces the crust upward and creates mountain ranges, such as the Himalayas.

⁴fissure: a small crack

⁵fault: a large, deep crack in the Earth’s crust

Or the reverse could happen. Plates can also 85 pull apart, causing continents to break up and oceans to form. Early in this process, as the distance between plates increases, the Earth’s crust stretches and thins out. Magma rises up, eventually cracking the thinned crust, and the 90 plates drift apart. Between the fault lines, the crust, now heavy with cooled magma, sinks to form a deep valley, often below sea level. The formation of this depression is an intermediate stage in the birth of an ocean. A bowl now sits 95 ready to accommodate water that rushes in from a nearby sea as soon as there is an open channel.

This is how the Atlantic was formed, separating Africa and Eurasia from the Americas. And this is what scientists believe is 100 happening in Afar as the Arabian, Nubian, and Somali plates pull apart. Parts of the region have already sunk to more than 100 meters (328 feet) below sea level. Only the highlands east and north of the Danakil Depression restrain the 105 Red Sea from rushing in. Eventually, erosion or quakes will create a break in the highlands, and the depression will quickly become an ocean floor. The new sea is predicted to be formed within about a million years. The complete 110 separation of the Nubian and Somali plates along the Great Rift Valley could take ten times as long. At that time, Africa will lose its distinctive horn as the Somali Plate heads east.

READING COMPREHENSION

Mark each sentence as *T*(true) or *F*(false) according to the information in Reading 2. Use the dictionary to help you understand new words.

- 1. During the 2005 earthquakes, pieces of rock flew up randomly out of the ground.
- 2. Water from the Red Sea has rushed into the Afar region.
- 3. A rift is a kind of opening.
- 4. Three tectonic plates come together in the Afar region.

continued

- 5. Before the 2005 earthquakes, the Afar region could accommodate farms.
- 6. Despite the region's remoteness, the effects of the 2005 quakes have been extensively studied.
- 7. Satellite photos of the Afar region show that a hole many miles long opened up in 2005.
- 8. Scientists believe magma will rise up between the tectonic plates and displace them, pushing them farther apart.
- 9. The Atlantic Ocean is the only thing restraining the new ocean from forming.
- 10. Residents of Afar hope the new ocean will soon help relieve the extreme heat in the region.