Lesson 7

Tsunami: The Big Wave

Over the centuries, geologists have learned that the earth is anything but a solid ball of rock. They know that the earth's crust is made of massive, interlocking “plates” riding on a molten mantle. These plates move very slowly. When they slide or grind against one another, an earthquake with devastating consequences may be triggered. If such an upheaval takes place on the ocean floor, the result can be even more catastrophic, for it may presage a tsunami, a series of ocean waves of such force that they can sweep away whole villages and pulverize the strongest buildings.

When an undersea section of the earth's crust shifts, it can displace a huge volume of water, releasing an enormous amount of kinetic energy. Because this energy is distributed over the entire depth of the water, its effects are not immediately apparent. All that can be seen are slight waves on the surface, even though they are traveling at speeds of over six hundred miles an hour. It is not until these undersea waves reach shallower waters that they unleash their awesome power. The energy that may have been diffused over a depth of several miles is now concentrated in water just hundreds of feet deep and getting shallower. A wave's velocity decreases, but its compressed energy forces it to grow in size. What might have begun several thousand miles away as a slight surface undulation two or three feet high becomes a wall of water thirty, sixty, even a hundred feet high which smashes everything in its path.

The coastal regions most in danger from tsunamis are those contiguous to the Pacific Ocean, where undersea geological events are more frequent. A tsunami powerful enough to cause serious damage occurs in the Pacific about every ten to fifteen years. Japan is especially prone to tsunamis since an area of intense seismic activity lies close to its eastern shore. The etymology of the name tsunami reflects Japan's familiarity with this terrifying phenomenon; it comes from two Japanese words, tsu (harbor) and nami (wave). Because the Japanese tsunamis have such a short distance to travel, coastal dwellers receive almost no warning of their onslaught. In the most vulnerable areas tall seawalls have been built to repulse the tsunami, but even a fifty-foot wall is of little value against a sixty- or hundred-foot wall of water.

The Hawaiian archipelago, located in the mid-Pacific and with no large land masses close by, is also particularly vulnerable to tsunamis. In 1946, an earthquake measuring 7.8 on the Richter scale and centered near Alaska's Aleutian Islands set off a tsunami, estimated to be over one hundred feet high when it reached the Alaskan coast. Traveling at 490 miles per hour, it struck Hawaii about five hours later. Waves fifty feet high flooded the coast, killing 173 people.
As a result of the 1946 disaster, the United States government established the Pacific Tsunami Warning Center, located just outside Honolulu. There, seismologists (scientists who study earthquakes) practice the recondite science of tsunami prediction by monitoring plate activity over a wide area of the Pacific. Prolonged quiet spells are punctuated by periods of frenetic action when the needles on sensing instruments start jumping, indicating an earthquake. The seismologists quickly correlate all the data they are receiving to pinpoint the location of the earthquake and estimate the likelihood of a tsunami striking, as well as its possible magnitude.

On the morning of December 26, 2004, a powerful earthquake, measuring 9.0 on the Richter scale, struck beneath the sea off the west coast of Sumatra, Indonesia. The earthquake—the fourth largest since 1900—sent a huge wall of water careening across the Indian Ocean. Waves over 100 feet high crashed without warning on the shores of several South Asian countries. The hardest hit were Indonesia, Sri Lanka, India, and Thailand. All told, more than 280,000 people lost their lives in this disaster. Millions more were among the missing and injured. The force of the tsunami was so intense that entire coastal villages and resorts were washed away.

Afterwards, many wondered why there was no warning that the giant wave was coming. While countries of the Pacific Rim have a system that gives them from three to fourteen hours’ warning of a tsunami, there is no such system in effect in the Indian Ocean countries. A mixture of circumstances such as poverty and remoteness of the various islands—not a cavalier attitude toward these giant waves—is most likely responsible for this situation. Anyone who has witnessed a tsunami understands the importance of providing this warning and will never forget this most fearsome of natural disasters.

Answer each question in the form of a sentence. If a question does not contain a word from the lesson, use one in your answer. Use each word only once.

1. Explain the etymology of tsunami.

2. What are two things that Alaska, California, and Japan have in common?

3. Why are many of the archipelagoes located in the Pacific so vulnerable to tsunamis?

4. What can be the consequence of a shift by one of the plates in the earth's crust?
5. How powerful is a large tsunami?
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___________________________________________________________________

6. Why might a person at sea not recognize a tsunami in its early stages?
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7. Why do you think the science of predicting tsunamis is described as **recondite**?
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8. Why would people who take a **cavalier** attitude toward a tsunami alert be a problem for public safety officials?
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9. What **presages** an earthquake to seismologists?
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10. Why can seawalls offer only partial protection against tsunamis?
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**FUN & FASCINATING FACTS**

- **Career** as a verb means “to move at high speed.” **Career** was originally a sailing term meaning “to tilt to one side when turning.” Perhaps confusion between these two terms led to **careen** taking on its present primary meaning, which can be thought of as a combination of the two original terms. **Career** is now infrequently used except in its well-known role as a noun.

- The English Civil War (1642–48) was fought between the Cavaliers, followers of King Charles I, and the Roundheads, supporters of parliamentary government, so called for their closely cropped hair. The king’s supporters believed that he ruled by divine right and were disdainful of those who believed otherwise. The Royalists lost the war and Charles lost his head; **cavalier**, without the capital c but with the dismissive Royalist attitude, entered the language.