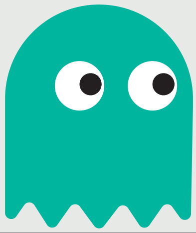
FOR AGES 15-10

LOOK DEEP INTO NATURE, AND THEN YOU WILL UNDERSTAND EVERYTHING BETTER.

THE POWER OF NATURE

TED-Ed

START >



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TSUNAMI

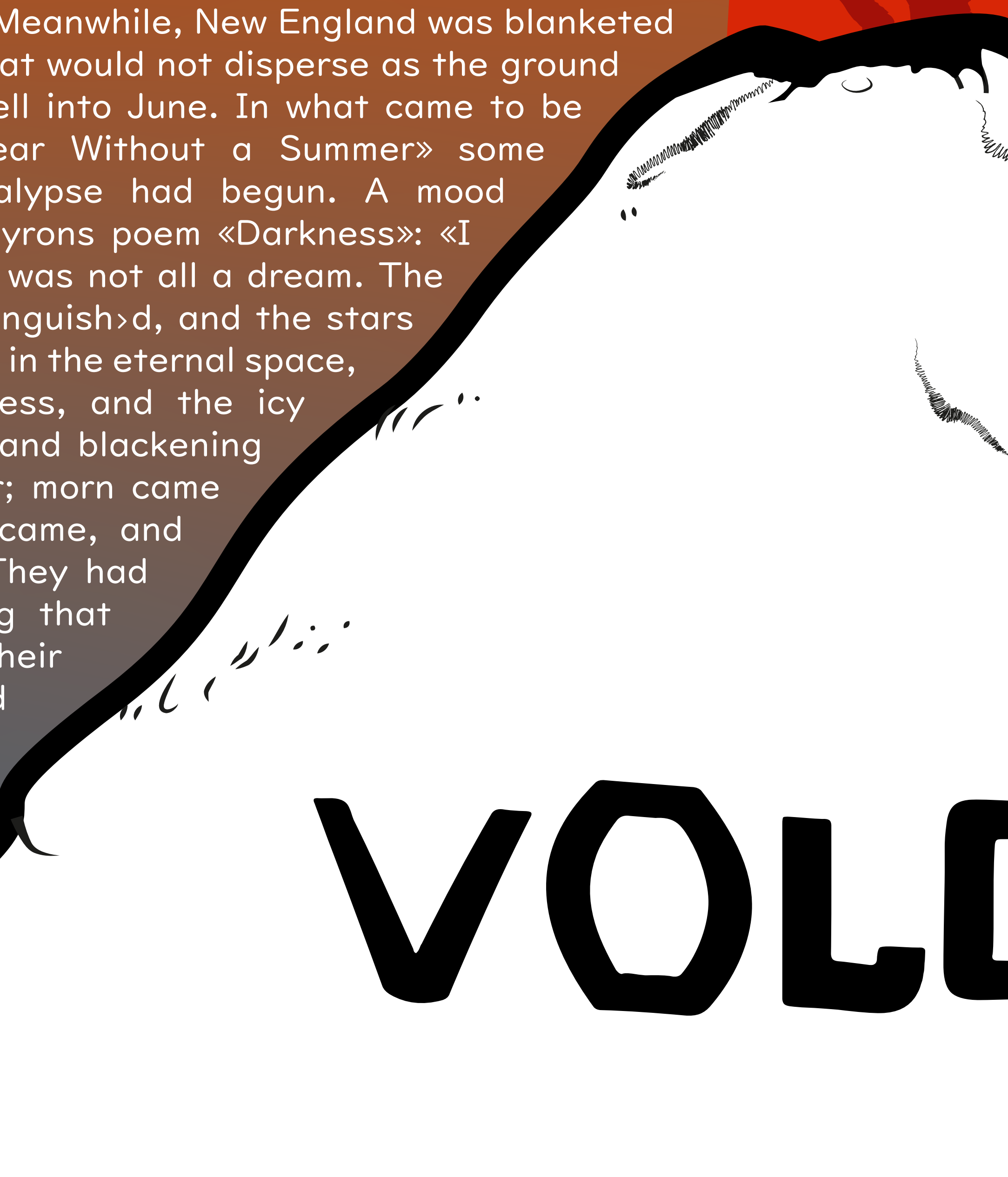
In 479 BC, when Persian soldiers besieged the Greek city of Potidaea, the tide retreated much farther than usual, leaving a convenient invasion route. But this wasn't a stroke of luck. Before they had crossed halfway, the water returned in a wave higher than anyone had ever seen, drowning the attackers. The Potiidaeans believed they had been saved by the wrath of Poseidon. But what really saved them was likely the same phenomenon that has destroyed countless others: a **tsunami**.

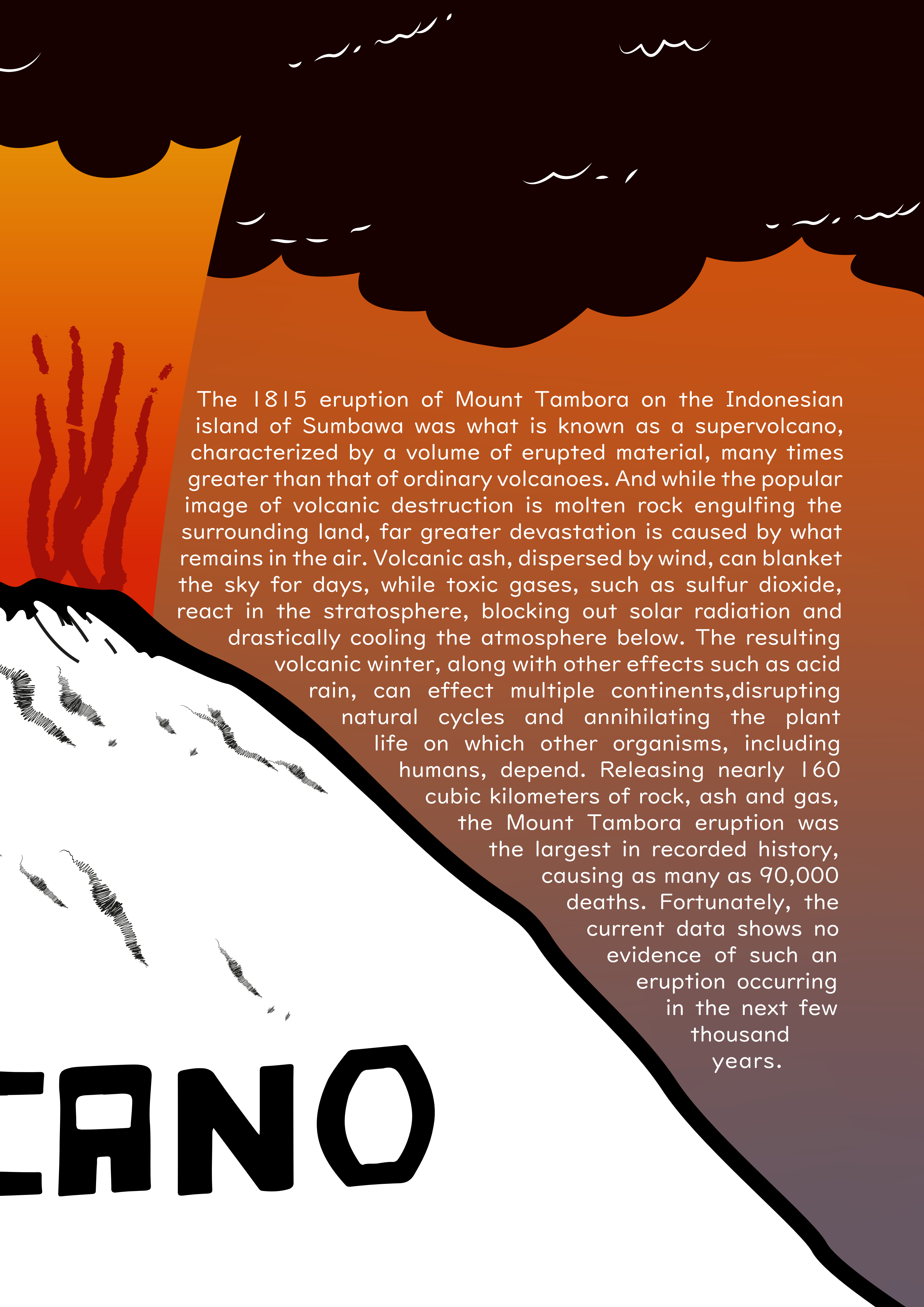
Although tsunamis are commonly known as tidal waves, they're actually unrelated to the tidal activity caused by the gravitational forces of the Sun and Moon. In many ways, tsunamis are just larger versions of regular waves.
The word tsunami, Japanese for "harbor wave" comes from the fact that it only seems to appear near the coast.
If the trough of a tsunami reaches shore first, the water will withdraw farther than normal before the wave hits, which can be misleadingly dangerous. A tsunami will not only drown people near the coast, but level buildings and trees for a mile inland or more, especially in low-lying areas.
When nature is too powerful to stop, the safest course is to get out of its way.


TORNADOES

Tornadoes are rapidly rotating columns of air that form inside storms that connect with the ground via a funnel of cloud. When that happens, they tear across the Earth, posing a huge threat to life and property. Because of this, theres a great deal of research into these phenomena, but the truth is, theres still a lot we dont know about how tornadoes form. The conditions that may give rise to one tornado wont necessarily cause another. But we have learned a lot since people first started recording tornadoes, like how to recognize the signs when one is brewing in the sky. Are you coming along for the ride? Tornadoes begin with a thunderstorm but not just any thunderstorm. These are especially powerful, towering thunderstorms called supercells. Reaching up to over 50,000 feet, they bring high force winds, giant hailstones, sometimes flooding and great flashes of lightning, too. These are the kinds of storms that breed tornadoes, but only if there are also very specific conditions in place, clues that we can measure and look out for when we are trying to forecast a storm. Rising air is the first ingredient needed for a tornado to develop. Even so, meteorologists and storm chasers like me will remain on the lookout, watching, always watching to see if the storm releases its long rope again.

The year was 1816. Europe and North America had just been through a devastating series of wars, and a slow recovery seemed to be underway, but nature had other plans. After two years of poor harvests, the spring brought heavy rains and cold, flooding the rivers and causing crop failures from the British Isles to Switzerland. While odd-colored snow fell in Italy and Hungary, famine, food riots and disease epidemics ensued. Meanwhile, New England was blanketed by a strange fog that would not disperse as the ground remained frozen well into June. In what came to be known as «the Year Without a Summer» some thought the apocalypse had begun. A mood captured in Lord Byrons poem «Darkness»: «I had a dream which was not all a dream. The bright sun was extinguish›d, and the stars did wander darkling in the eternal space, rayless, and pathless, and the icy Earth swung blind and blackening in the moonless air; morn came and went -- and came, and brought no day.» They had no way of knowing that the real source of their misfortunes had occurred a year ago thousands of miles away.





The 1815 eruption of Mount Tambora on the Indonesian island of Sumbawa was what is known as a supervolcano, characterized by a volume of erupted material, many times greater than that of ordinary volcanoes. And while the popular image of volcanic destruction is molten rock engulfing the surrounding land, far greater devastation is caused by what remains in the air. Volcanic ash, dispersed by wind, can blanket the sky for days, while toxic gases, such as sulfur dioxide, react in the stratosphere, blocking out solar radiation and drastically cooling the atmosphere below. The resulting volcanic winter, along with other effects such as acid rain, can effect multiple continents,disrupting natural cycles and annihilating the plant life on which other organisms, including humans, depend. Releasing nearly 160 cubic kilometers of rock, ash and gas, the Mount Tambora eruption was the largest in recorded history, causing as many as 90,000 deaths. Fortunately, the current data shows no evidence of such an eruption occurring in the next few thousand years.


GLACIER

In the wide,
glaciers require three conditions to grow:
Snowfall, cold temperatures, and time. First, a great deal of snow
falls and accumulates. Cold temperatures then ensure that the stacked up snow persists throughout the winter, spring, summer, and fall. Over the following years, decades, and centuries, the pressure of the accumulated snow transforms layers into highly compacted glacial ice. Artificially growing a glacier, however, is completely different. At the confluence of three great mountain ranges, the Himalayas, Karakoram, and Hindu Kush, some local cultures have believed for centuries that glaciers are alive. And what's more, that certain glaciers can have different genders including male and female. Local Glacier Growers 'breed' new glaciers by grafting together or marrying fragments of ice from male and female glaciers, then covering them with charcoal, wheat husks, cloths, or willow branches so they can reproduce. Under their protective coverings, these glacierets transform into fully active glaciers that grow each year with additional snowfall. Those then serve as lasting reserves of water that farmers can use to irrigate their crops. These practices have spread to other cultures, where people are creating their own versions of glaciers and applying them to solve serious modern challenges around water supplies. Take Ladakh, a high-altitude desert region in northern India. It sits in the rain shadow of the Himalayas and receives on average fewer than ten centimeters of rain per year. As local glaciers shrink because of climate change, regional water scarcity is increasing. And so, local people have started growing their own glaciers as insurance against this uncertainty. These glaciers come in two types: horizontal, and vertical. Horizontal glaciers are formed when farmers redirect glacier meltwater into channels and pipes, then carefully siphon it off into a series of basins made from stones and earth.
well enough to build whole walls of ice–


EARTHQUAKE

Earthquakes have always been a terrifying phenomenon, and theyve become more deadly as our cities have grown, with collapsing buildings posing one of the largest risks. If youve watched a lot of disaster films, you might have the idea that building collapse is caused directly by the ground beneath them shaking violently, or even splitting apart. But thats not really how it works. For one thing, most buildings are not located right on a fault line, and the shifting tectonic plates go much deeper than building foundations. In fact, the reality of earthquakes and their effect on buildings is a bit more complicated. To make sense of it, architects and engineers use models, like a two-dimensional array of lines representing columns and beams, or a single line lollipop with circles representing the buildings mass. Even when simplified to this degree, these models can be quite useful, as predicting a buildings response to an earthquake is primarily a matter of physics. Most collapses that occur during earthquakes arent actually caused by the earthquake itself. Instead, when the ground moves beneath a building, it displaces the foundation and lower levels, sending shock waves through the rest of the structure and causing it to vibrate back and forth. The strength of this oscillation depends on two main factors: the buildings mass, which is concentrated at the bottom, and its stiffness, which is the force required to cause a certain amount of displacement.

Today, engineers work with geologists and seismologists to predict the frequency of earthquake motions at building sites in order to prevent resonance-induced collapses, taking into account factors such as soil type and fault type, as well as data from previous quakes. Engineers have also devised ways to abosrb shocks and limit deformation using innovative systems. Base isolation uses flexible layers to isolate the foundations displacement from the rest of the building, while tuned mass damper systems cancel out resonance by oscillating out of phase with the natural frequency to reduce vibrations. In the end, its not the sturdiest buildings that will remain standing but the smartest ones.

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