

The Birth of the Hawaiian Islands

by Elizabeth Knapp

On the big island of Hawaii, an ancient legend still stirs deep within the earth. The story begins with Pele, the beautiful yet fiery Goddess of Volcanoes. And while science now has its own version of the story, the legend of Pele lives on. For many, the goddess who gave birth to the Hawaiian Islands is now the lava and steam rising from Kilauea, the most active volcano on Earth.

Pele was a goddess who was both honored and feared. She was often angry and could cause volcanic eruptions with her magic stick, called Pa'oa. She could also cause earthquakes by stamping her feet. Pele and her older sister, Namakaokahai, Goddess of the Sea, were bitter enemies. According to legend, their stormy fight led to the birth of the Hawaiian Islands.

Pele first used her Pa'oa on Kauai, the island in the Hawaiian chain that is farthest north. After starting a fire, Pele was attacked by her sister and left for dead. But Pele recovered and moved southeast to Oahu. Here, she dug many "fire pits" to live in, including the crater known as Diamond Head in Honolulu. Each time she dug a fire pit, a new volcano (and island) was formed. Pele continued moving southeast to Molokai and then on to Maui, where she created Haleakala Volcano.

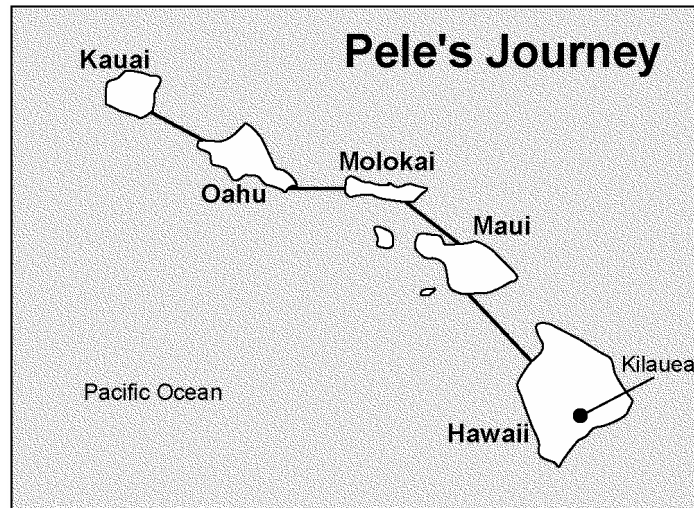


Photo Courtesy of Erin Heer

Diamond Head

When she learned that Pele was still alive, Namakaokahai went to Maui to fight her. After a great battle, Namakaokahai again believed that she had killed her sister. But Pele proved her wrong. Pele landed on the big island of Hawaii,

where she created Mauna Loa Volcano. Finally, realizing that she could never defeat Pele, Namakaokahai gave up the fight. According to legend, Pele now lives in the Halemaumau Crater at the top of Kilauea.



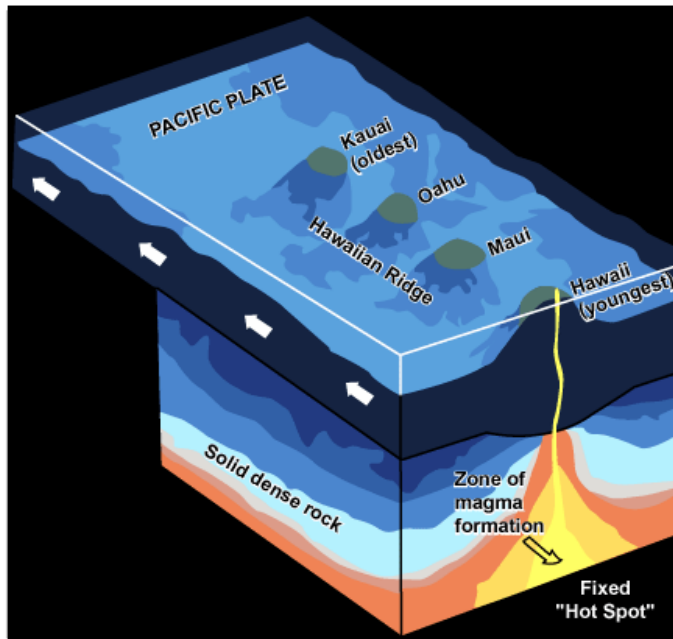
Through Pele, the ancient Hawaiians tried to piece together the story of their islands. In their travels, they noticed differences on each island. For example, they saw that the islands of Maui and Hawaii were much less *eroded*, or worn away, than the island of Kauai. Long before science had the answer, these people had a basic idea of how the Hawaiian Islands had formed.

In 1838, a scientist named James Dwight Dana made an important discovery. He found that, just as the legend states, the northwestern islands of Kauai and Oahu are older than the southeastern islands of Maui and Hawaii. Dana based his discovery mostly on the differences in erosion on each island. In addition, he found that the volcanoes that had not erupted in some time were the most eroded.

Dana believed that the Hawaiian Islands had formed along a *fissure zone*, an area of cracks or openings that ran across the floor of the Pacific Ocean. His "great fissure" idea was backed by most scientists for the next 125 years.

In 1963, a scientist named J. Tuzo Wilson came up with a new idea. His "hotspot" theory has since been accepted by many scientists. It builds in turn on a widely accepted idea called plate tectonics. According to this theory, the earth's surface, or *crust*, consists of huge, flat plates of rock. These plates float on a layer of softer rock called the *mantle*. Wilson believed that there are small

regions under the crust where *magma*, very hot liquid rock from inside the mantle, has broken to the surface. As the plates move slowly over these “hotspots,” volcanoes are formed.



According to Wilson, there is a hot spot in the middle of Pacific Plate, the plate that contains the Hawaiian Islands. Millions of years ago, as the plate moved over the hot spot, magma from the hot spot pushed up through the earth until it erupted on the sea floor. As more eruptions took place, a volcano formed underwater. It grew higher and higher until it

finally rose above sea level to form Kauai, the first island volcano. As the plate continued moving over the hot spot, each of Hawaii's islands formed in the same way.

Like both the legend of Pele and Dana's great fissure idea, the hot spot theory says that the islands are older and more eroded the farther they are from the hot spot. Wilson found that the rocks on Kauai are much older and more eroded than those on the big island of Hawaii. Kauai's oldest rocks are about 5.5 million years old. Those on Hawaii are less than 0.7 million years old. And since Hawaii is still over the hot spot, new rocks are still being formed.

The living nature of volcanoes is most obvious in Kilauea, Pele's present home. There, lava continues to pour out of the volcano, as it has since 1983. As the youngest volcano in the Hawaiian chain, it sees quite a bit of activity. From beautiful lava flows to fiery fountains, Pele puts on an amazing show.

The Volcanoes of Hawaii

by Elizabeth Knapp

Did you know that Hawaii is the only state in the United States made entirely out of volcanoes? When we look at the Hawaiian Islands, we are really looking at the tops of a range of mountains—volcanic mountains—rising from the floor of the North Pacific Ocean. The Hawaiian *archipelago*, or island chain, is regarded as one of the greatest mountain ranges on Earth.

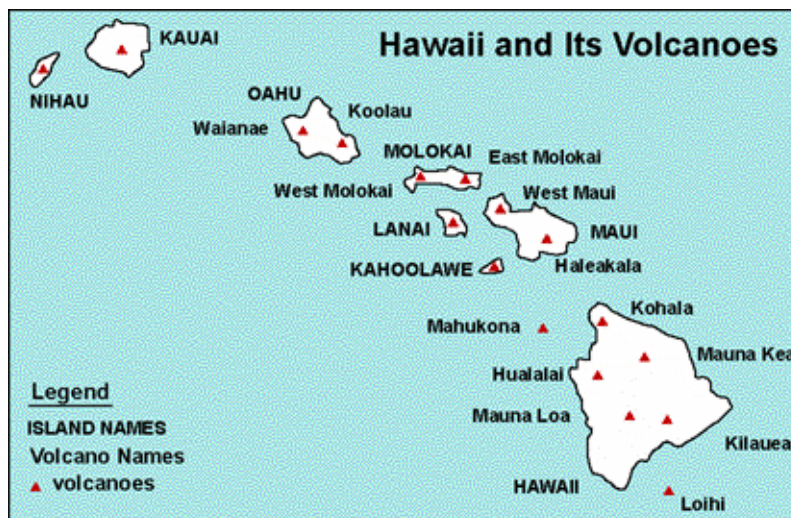
There are eight main volcanic islands and one smaller island that make up the state of Hawaii. Each island is made up of one or more volcanoes. Some of these volcanoes are under the ocean.

Others, like Mauna

Loa, the largest active volcano in the world, rise to a towering height above sea level. Some volcanoes in Hawaii rise more than 30,000 feet from the sea floor.

More than 70 million years ago, the first of Hawaii's volcanoes began to form on the ocean floor. Many scientists believe that the volcanoes grew from a *hotspot*, an area where liquid rock from the earth's interior pushes up through the earth's surface. This liquid rock is called *magma*, and it is very hot. In fact, magma is so hot that it can melt steel.

In many ways, Hawaii's volcanoes are different from other volcanoes in the world. But all volcanoes form in the same way. Rock melts into magma in the hot interior of the earth. Because this liquid rock is under pressure and lighter than the solid rock around it, it begins to rise. Sometimes the magma pushes up through weak spots in the ground called *vents*. Other times, it rises through *pipes*, or tunnels in the ground. When the magma pushes the ground up, it forms



a mountain. If it pushes through the top of the mountain or through the ground somewhere else, it forms a volcano.



Photo Courtesy of USGS.gov

Shield volcano

The volcanoes of Hawaii are called *shield volcanoes*. This is because they look like a warrior's shield. Shield volcanoes are large volcanoes with wide craters and low, gently sloping sides. In shield volcanoes, layers of *lava*, or magma that has broken through the earth's

surface, harden and form the *cone*, the volcano's sloping sides.

Unlike other types of volcanoes, shield volcanoes do not produce violent explosions when they erupt. An eruption usually begins with a *lava fountain* bursting from a *fissure*, or crack in the volcano's slope. Often, several fountains along the length of a fissure form a *curtain of fire* that sends lava shooting several hundred feet in the air. While this may sound violent, it is quiet compared to how other volcanoes erupt. Some blast out ash and lava at more than 600 miles per hour.

Hawaiian lava has a low *viscosity*, meaning that it flows easily. As a result, it can travel long distances at tens of miles per hour. Lava flows from Mauna Loa have even traveled as far as 37 miles, to the city of Hilo. Also, because Hawaiian lava is so fluid, eruptions create beautiful lava fountains, rivers, and ponds. And since the eruptions are not violent, it is possible for people to get close to the lava flows—close enough even to roast marshmallows!

When the lava flows cool, they form a type of rock called *basalt*. Basalt is usually black or dark gray in color. Even after it has cooled and hardened, basalt shows how it was once liquid. Hawaiians use two words to describe the way basalt lava flows

and cools, words that scientists have adopted, too. The first, *pahoehoe* (pronounced *pa-hoy-hoy*), means “ropy.” Pahoehoe basalt forms when a layer of “skin” covers the liquid lava. As the lava under the skin continues to flow, it wrinkles and creates a ropy surface.

The second is *aa* (pronounced *ah-ah*). Unlike pahoehoe lava, aa lava produces sharp, jagged surfaces when it cools. In fact, some people think that the word *aa* is what a Hawaiian would say while walking on it—“ah, ah!”



Photo Courtesy of USGS.gov

Pahoehoe



Photo Courtesy of USGS.gov

Aa

Not all of Hawaii’s volcanoes are active. Some are *dormant*, meaning they haven’t erupted for many years. Others are *extinct*, meaning scientists believe they will never erupt again. But those that are still active are fascinating places.

Kilauea, on the big island of Hawaii, is the most active volcano on Earth. Each day, enough lava flows down the sides of Kilauea to fill almost 300 Olympic-sized swimming pools.

Visitors to Hawaii Volcanoes National Park can see Kilauea up close, as hot lava pours from the volcano into the ocean. They can hike down roads lined with craters and see vast Mauna Loa in the distance. They can even tour a *lava tube*, a long tunnel formed under the surface of the lava flow as it hardens. Whatever they do, one thing’s for sure—the action is hot!

