Introduction, Part 1: Hydrothermal Features of Yellowstone

Hot springs are naturally occurring warm bodies of water heated from underground to near-boiling temperatures (93˚C or 199˚F). The bright colors (see the picture at right) are cyanobacteria called extremophiles.

The water in **mud pots** tends to be more acidic and dissolves the surrounding rhyolite rock. Water mixes with the dissolved rock to create these bubbly pots.

Fumaroles are caused by cracks in the earth that allow superheated water to create a continuous flow of steam.

Geysers are hot springs that trap steam in underground spaces and build pressure, causing periodic eruptions. There are more than 300 active geysers in Yellowstone, which is more than any other place in the world. The most famous of Yellowstone's geysers is Old Faithful. While it is neither the largest nor the most regular geyser, it is certainly the most watched geyser.

Hot spring.

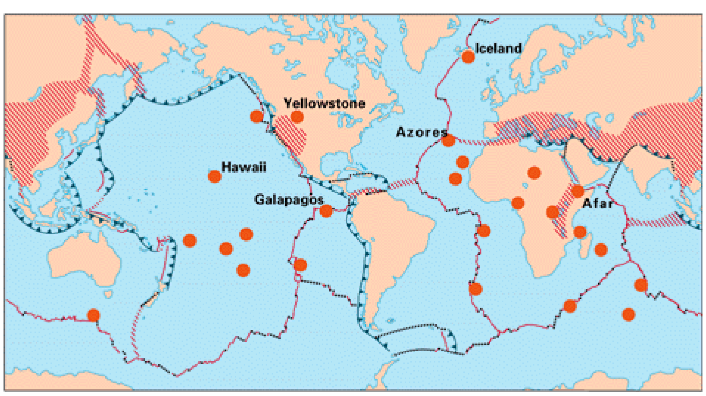
Mud pot near mud volcano.

Old Faithful geyser erupting.

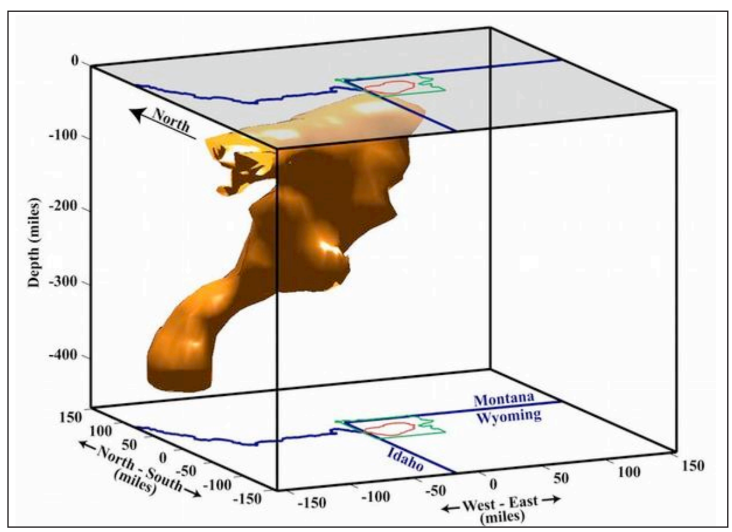
Steam rising from fumeroles.

Introduction, Part 2: Hotspot Theory

Most earthquakes and volcanic eruptions occur near plate boundaries, but there are some exceptions. In 1963, John Tuzo Wilson, the same scientist who discovered transform faults, came up with a theory for these exceptions. Wilson described stationary magma chambers, or hot spots, beneath the plate crust that could cause volcanic activity far from any boundary zone.



In this U.S. Geological Survey (USGS) map, you can notice some of the most established hotspots in the world.

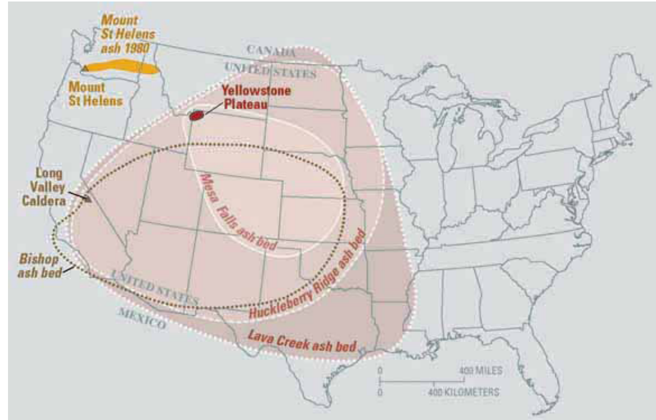


Recent seismic technology, called seismology, has allowed scientists to create a picture of the magma (liquid) chamber within the solid crust that has caused this path of calderas. What they found is a chamber that is more enormous than they ever imagined. This image was created by seismologists at the University of Utah and the U.S. Geological Survey (USGS).
The park boundaries are outlined in green at the surface, or top, of the illustration. The Yellowstone caldera, or giant volcanic crater, is outlined in red. State boundaries are shown in black. The park, caldera, and state boundaries are also projected on the bottom of the illustration to better show the plume's tilt.

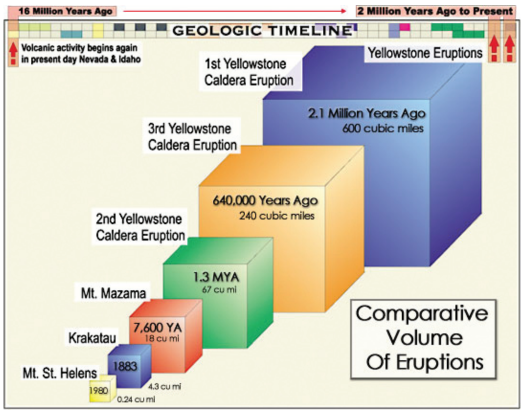
Introduction, Part 3: Yellowstone Supereruptions

The past three eruptions from Yellowstone have been so large that they are considered supereruptions. Occurring almost every 600,000 years, the last eruption, the Lava Creek Eruption (640,000 years ago), was one of the largest in known history, covering the green areas shown in the map at right.

Take a moment to look at the comparison (below) of the volume of some of the major eruptions in known history. Notice how some of the most influential eruptions in recent history (Mt. St. Helens, Krakatau, etc.) compare to the potential from Yellowstone's most recent eruptions.



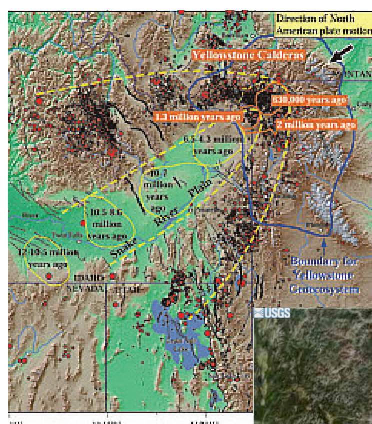
By comparing the Yellowstone eruption to the global effects of smaller eruptions, such as Mt. St. Helens in 1980, scientists can extrapolate the global effects of larger eruptions.



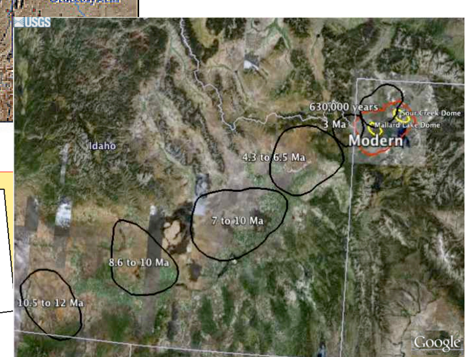
Introduction, Part 4: Understanding the Path of Calderas

Evidence supports John Tuzo Wilson's theory that the Pacific plate moved northward over the fixed Hawaiian Hotspot—the island of Hawaii is the youngest and most volcanically active island, with the other Hawaiian islands becoming progressively older and inactive as you move north.

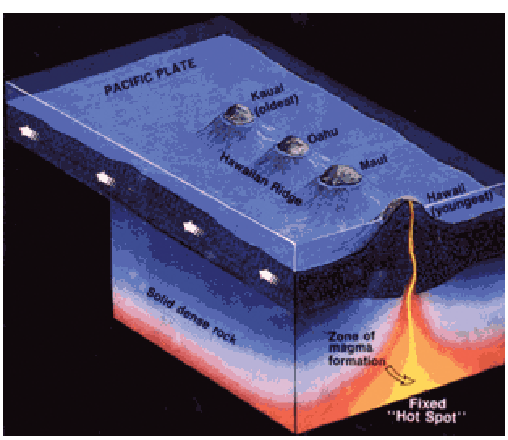
Similar to the relationship between the Hawaiian Hostpot and the Pacific plate, the North American plate has been moving over the fixed Yellowstone Hotspot, melting a path through the Rocky Mountains.



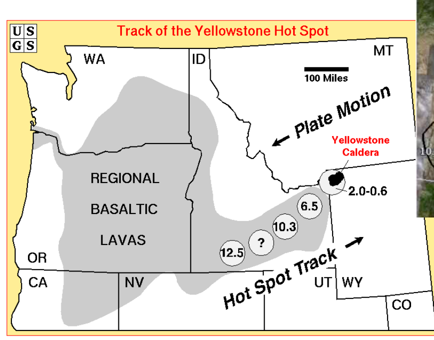
Notice the uplifting and faulting that created new mountains around the calderas.



This Google™ Earth map shows the caldera outlines that began 12 million years ago.



The Hawaiian Hotspot and Pacific Plate.



Tracking the Hot Spot. *This image is from a USGS simulation of the path of calderas created over time.*