Resource from animation found at: <http://www.iris.edu/hq/inclass/search>

**Narration from the animation:**

**Layered Earth vs Uniform Earth**

If the earth had no changes with depth, seismic waves would travel straight paths. But the earth has composition, density and temperature changes that cause the seismic rays to refract as velocity in the mantle generally increases with depth.

We can zoom into a shallow part of the crust to watch how waves behave when crossing into boundaries of higher velocity.. We will track two paths from an earthquake: The direct path travels to station X through the slowest layer. The other path continually refracts as it crosses boundaries of increased velocity until the incident ray reaches a critical angle and begins sending a head wave to the surface. These head waves return to the surface refracting back at the same angles and velocities that they descended with. This is because they follow Snells law at each boundary with relative velocities now decreasing upward.

Some of the critically refracted waves reach station X and beyond before the blue direct wave which took the short cut. This is because the velocity increases were great enough to overcome the slower direct path.

The dashed black line emphasizes how much the wave is refracted in each layer.