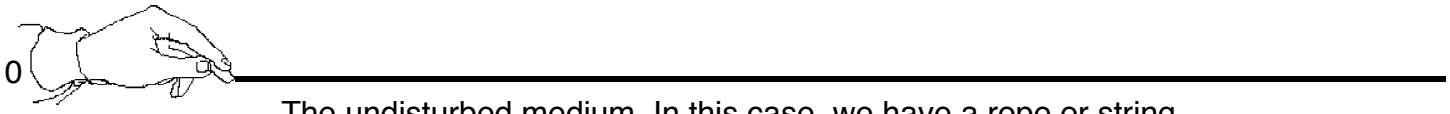
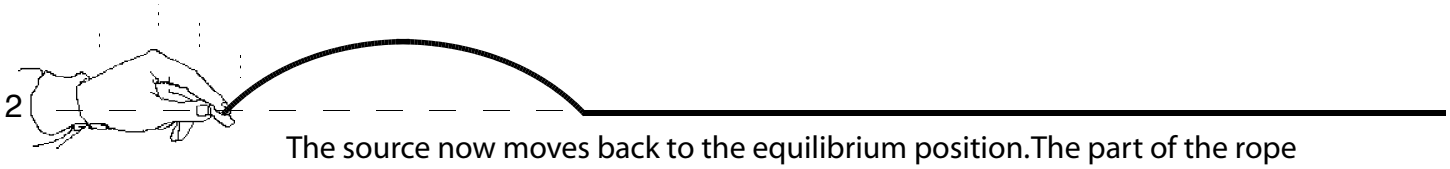
PhyzGuide: Making Waves 1

TRANSVERSE WAVES

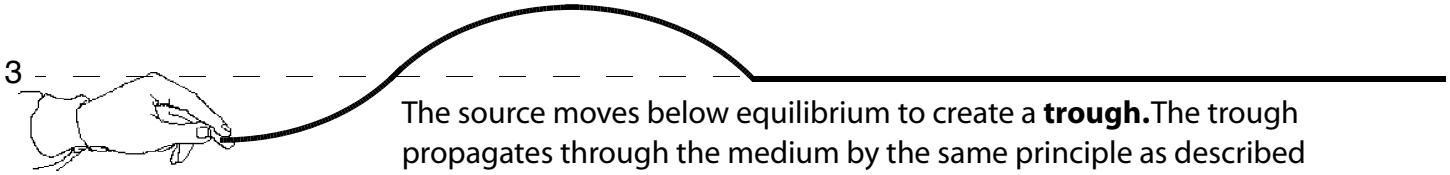


The undisturbed medium. In this case, we have a rope or string.

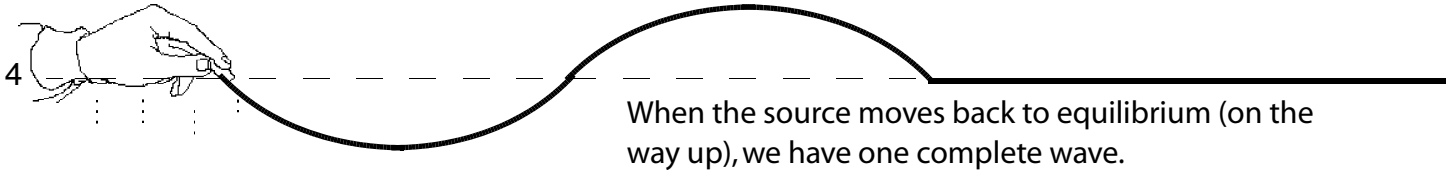
The left end is pulled upward by the energy-loading source. We now have a **crest.** The rope that has been pulled up tugs on the undisturbed rope to the right of it, and so the wave propagates to the right.



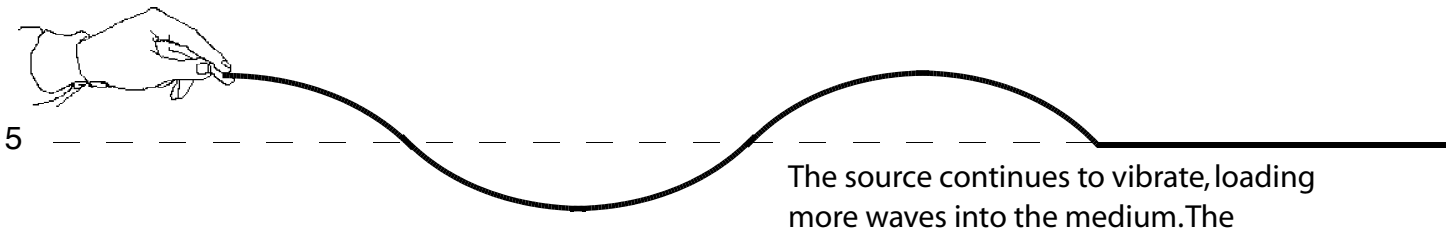
The source now moves back to the equilibrium position. The part of the rope that has been pulled down now tugs at the disturbed length of rope to its right, and so the "back side" of the crest propagates to the right.



The source moves below equilibrium to create a **trough.** The trough propagates through the medium by the same principle as described above.



When the source moves back to equilibrium (on the way up), we have one complete wave.



The source continues to vibrate, loading more waves into the medium. The **wavelength** *may* be measured as the distance from one crest to the next.

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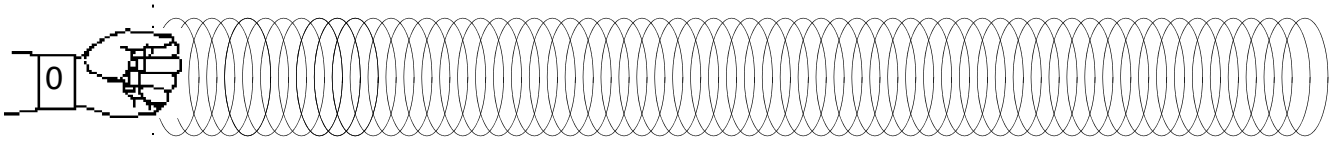
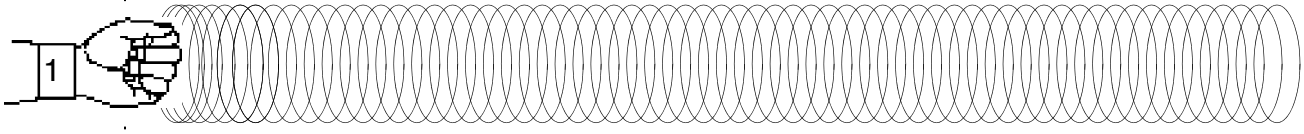
PhyzGuide: Making Waves 2

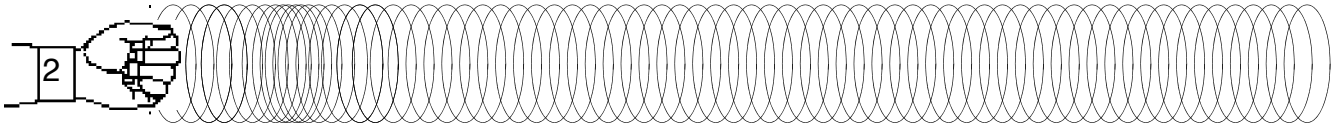
LONGITUDINAL WAVES



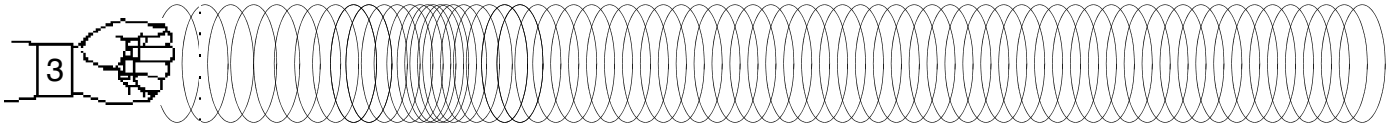
We begin with the undisturbed medium. The medium shown above is a spring, but any elastic or compressible material will do. Air, for example, is a compressible medium through which longitudinal waves readily travel. Longitudinal waves in air are *sound* waves.



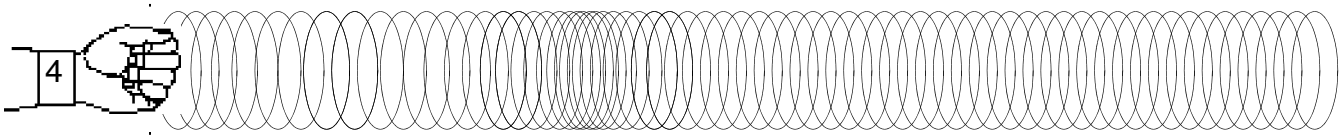
The end of the spring is pushed inward more quickly than the spring as a whole can respond, so the coils get squeezed together in that region. This is called a **compression.** The rest of the spring remains unchanged—the energy of the push went into compressing the coils at the end, not into moving the entire spring.



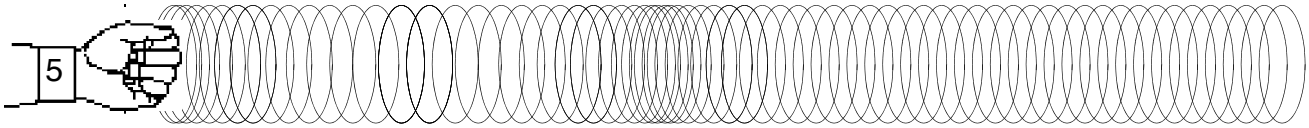
Coils are happy when they are *not* compressed, so compressed coils are not happy coils. A restoring force expands the compressed coils but compresses neighboring coils; the compression thus travels down the length of the spring. Meanwhile, the left end of the spring has been forced back through its equilibrium...



...and past its equilibrium to induce stretching of the spring. The coils are farther from each other in what is called a **rarefaction** or expansion. The compression meanwhile continues on its journey to disturb the rest of the spring.



The left end is again forced back to equilibrium. At this point, one complete wave has been generated (from equilibrium toward compression as shown in #0 to equilibrium toward compression as shown here in #4). Meanwhile, the compression and rarefaction travel down the length of the spring.



The left end is forced once again into compression. The **wavelength** may be taken as the distance between the two compressions. More waves can be loaded if the source (hand) continues to oscillate in simple harmonic motion.

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