FIGURE 11–20 Water waves spreading outward from a source.

11–7 Wave Motion

When you throw a stone into a lake or pool of water, circular waves form and move outward, Fig. 11–20. Waves will also travel along a cord that is stretched out straight on a table if you vibrate one end back and forth as shown in Fig. 11–21. Water waves and waves on a cord are two common examples of wave motion. We will discuss other kinds of waves later, but for now we will concentrate on these **mechanical waves**.

If you have ever watched ocean waves moving toward shore before they break[†], you may have wondered if the waves were carrying water from far out at sea into the beach. They don't. Water waves move with a recognizable velocity. But each particle (or molecule) of the water itself merely oscillates about an equilibrium point. This is clearly demonstrated by observing leaves on a pond as waves move by. The leaves (or a cork) are not carried forward by the waves, but simply oscillate about an equilibrium point because this is the motion of the water itself.

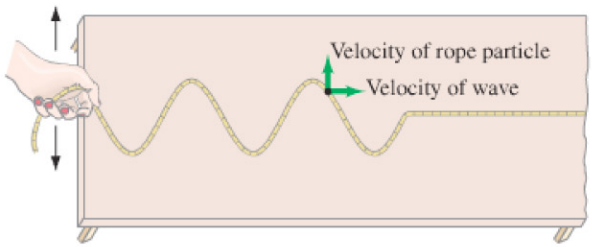

FIGURE 11–21 Wave traveling on a cord. The wave travels to the right along the cord. Particles of the cord oscillate back and forth on the tabletop.

CONCEPTUAL EXAMPLE 11–10 **Wave vs. particle velocity.** Is the velocity of a wave moving along a cord the same as the velocity of a particle of the cord? See Fig. 11–21.

RESPONSE No. The two velocities are different, both in magnitude and direction. The wave on the rope of Fig. 11–21 moves to the right along the tabletop, but each piece of the rope only vibrates to and fro. (The rope clearly does not travel in the direction that the wave on it does.)

Waves can move over large distances, but the medium (the water or the rope) itself has only a limited movement, oscillating about an equilibrium point

[†]Do not be confused by the "breaking" of ocean waves, which occurs when a wave interacts with the ground in shallow water and hence is no longer a simple wave.