CHAPTER OVERVIEW

5: Wave Speed

There are two different speeds involved with describing a wave. In previous chapters we saw that the individual points on a wave oscillate (up and down for transverse waves, back and forth for longitudinal waves) with simple harmonic motion, just like masses on springs. A point on a transverse wave moves fastest as it passes through the equilibrium point, slows down as it reaches the maximum amplitude, stops, turns around and increases speed in the opposite direction. So this speed is changing over time; points on the wave accelerate up and down.

But the up and down speed of a point on a transverse wave doesn't tell us how fast the wave moves from one place to the next. The ***wave speed***, v, is how fast the wave travels and is determined by the properties of the medium in which the wave is moving. If the medium is uniform (does not change) then the wave speed will be constant. The speed of sound in dry air at $20^{\circ}\mathrm{C}$ is $344\ \mathrm{m/s}$ but this speed can change if the temperature changes.

It is also possible to include the direction and define a vector called the ***wave velocity*** which is speed and direction but for now we will just talk about wave speed.

Key Terms:

Speed of a point on the wave, speed of the wave, velocity of the wave, bulk modulus (compressibility), Young's modulus (stiffness), speed of electromagnetic waves, speed of sound in different media, linear waves, $v = \lambda f$, wave number, angular frequency, index of refraction.
