

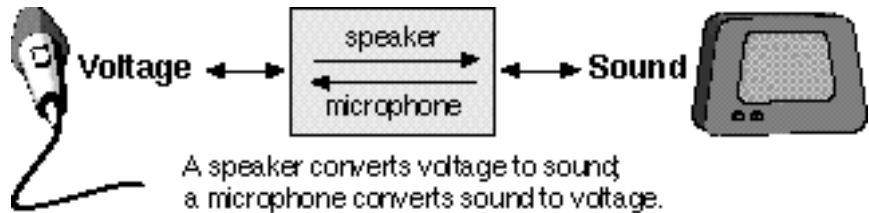
What happens inside a microphone once a sensor detects a stimulus? Smart sensor systems such as the one you just investigated all involve signal processors. Read here to find out more about them.

Microphones—and speakers—are transducers that convert mechanical energy (sound) to electrical energy and vice versa, as shown in the diagram above.

This is traditionally done with a coil of wire wrapped around a magnet, as shown in the diagram below. If the coil is moved, a voltage is produced. If a changing voltage moves through the coil, it causes the coil to move.

A piezoelectric material behaves in much the same way. When a sound wave causes it to wiggle back and forth, the material creates an electrical signal. If the material receives a changing electrical signal, the material vibrates in response.

In the microphone you just built, PVDF works as a signal



generator. Since the motion of the film is small, it must be put in contact with something larger to create an audible sound. This is where substrates—materials such as stretchy plastics to which piezo films can be attached—and signal processing come in. Substrates amplify the film's vibration, making a larger vibration that generates a greater voltage. Signal processors such as amplifiers increase the strength of the voltage.

Almost all sensors—like the piezoelectric film in your microphone—produce low-level input signals (very small voltages). Bringing these sig-

nals to levels compatible with other devices or to audible levels requires an amplifier. An amplifier is a device that makes a weak signal stronger. The output signal from the amplifier contains the same frequency features as the input signal. That is why the sound you hear from the speaker is the same as the sound you make on or into the film when you use an amplifier. Using a substrate enhances the vibration of the film and increases the voltage it sends toward the amplifier, making the microphone a better sound-reproducer than the PVDF film alone.

