The Ear Remembers

Your inner ear remembers sounds even after the sound has ended, according to Dr. Alfred L. Nuttall of the Oregon Hearing Research Center. The sound vibrations are stored in the inner ear as “after-vibrations.” What’s interesting about this finding is that even minor hearing loss can cause a major decrease in after-vibrations.

Inside the inner ear, there’s a structure called the cochlea--the organ that enables hearing. The cochlea is a fluid-filled coil that contains a membrane and hair cells. Sound travels as a series of vibrations into this membrane, is captured by the hair cells, and then transmitted as sound information to the brain.

In other words, scientists have long assumed that hair cells only move when impacted by sound vibrations. Now we can assume, based on this study, that vibrations are remembered for some time after the sound has ended. Nuttall and his team found that the degree of after-vibrations could be determined by the strength and frequency of the sound stimuli.

"The after-vibrations appear to be driven by sustained force production in the inner ear--a form of short-term memory of past stimulations," says Nuttall. "The ability to detect brief gaps in an ongoing stimulus is critical for speech recognition; gaps need to be longer than a minimal interval to be perceived. To the extent that after-vibrations excite the auditory nerve fibers, they may explain part of the difficulty in detecting such gaps."
Since we rely on gaps between sounds to understand speech, these after-vibrations may affect our ability to hear and perceive speech.

Sources:

Persistence of Past Stimulations: Storing Sounds within the Inner Ear. Jiefu Zheng, Sripriya Ramamoorthy, Tianying Ren, Wenxuan He, Dingjun Zha, Fangyi Chen, Anna Magnusson, Alfred L. Nuttall, Anders Fridberger. Biophysical Journal, 2011; 100 (7): 1627-1634 DOI: http://www.cell.com/biophysj/retrieve/pii/S0006349511002438