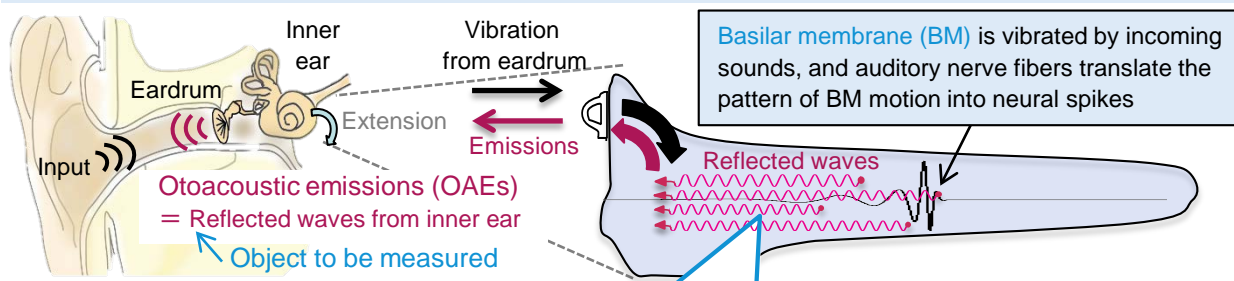


~Coding of amplitude modulation in the inner ear~

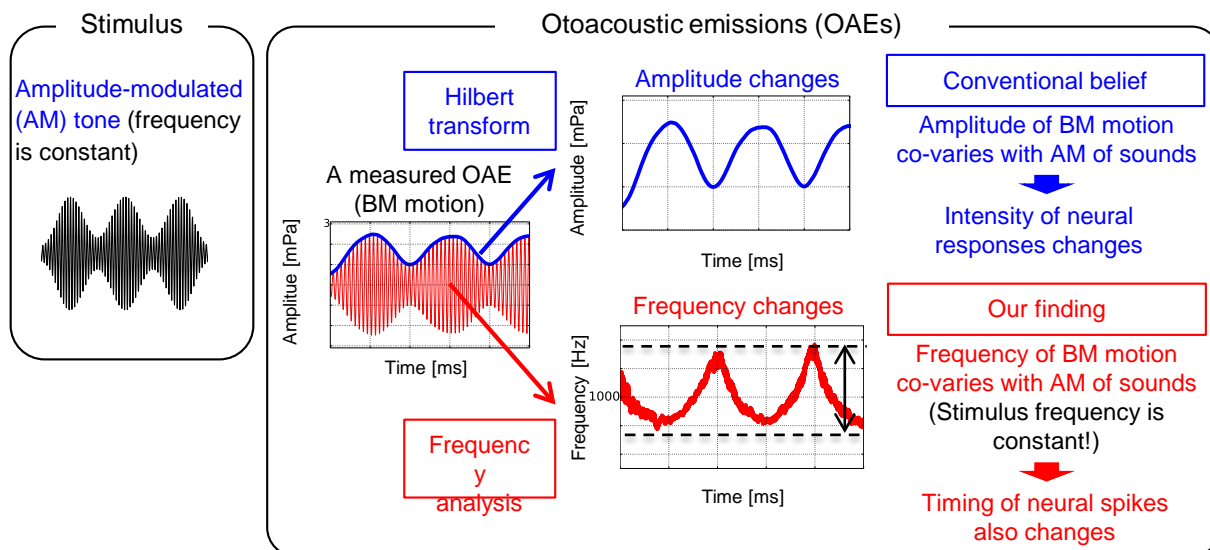
Abstract

The ear works as an amplifier. We have been investigating its characteristics by using otoacoustic emissions—"sounds from the ear", and have revealed that **the ear does not simply amplify sounds**. Here we report our new finding that the ear translates **sound intensity information** into **timing information of neural spikes**. Prior to this finding, **sound intensity information** was believed to be expressed as **the intensity of neural responses**. Our finding questions the conventional belief about **how we perceive the intensity of sounds**, and it has significant implications on the disabilities caused by aging-related malfunctions of the ear. The study should also contribute to improving the performance of **cochlear implants** and **hearing aids**.



Conventional belief: Sound intensity information is expressed as the **intensity** of neural responses

Our finding: Sound intensity information is expressed as the **timing** of neural spikes



We found that the ear translates intensity information into timing information of neural spikes. Our psychophysical experiments also revealed that the spike-timing information contributes to perceiving the intensity of sounds.

[Reference]

- [1] S. Otsuka, S. Furukawa, "Representation of Amplitude-Modulation Signal by Phase Modulation in Auditory Periphery: An Investigation by Otoacoustic Emissions," *Autumn Meeting of Acoustical Society of Japan*, 2015.
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