

It's not just about audibility, it's about creating order out of acoustic chaos

Effective hearing care has moved far beyond making sounds audible. Increasing speech intelligibility depends on so much more. Amplifying sounds while preserving not only the dynamics of the signal but also many of the fine temporal structures and subtle acoustic cues is essential in modern hearing care; hence the focus in Oticon's research and development.

The brain is wired to absorb all of the sensory information around us and to **organize** it into meaningful percepts. It untangles and separates different sound sources - such as one voice from another; sounds coming from the kitchen versus sounds coming from the TV in the next room; traffic noise versus playground noise, etc. The more accurately and naturally the information can be presented, the easier it becomes for the brain to create order out of the apparent acoustic chaos of a soundscape.

Auditory input is extremely complex: rapidly-changing acoustic events can contain everything from intricate timing cues, harmonics and loudness information to a phenomenal amount of information embedded in the frequency spectrum. The purpose of modern hearing care is to help the brain restore order to what seems like chaos, using whatever sources of information are available, including: visual cues, situational cues and acoustic information such as spatial cues and speech characteristics.

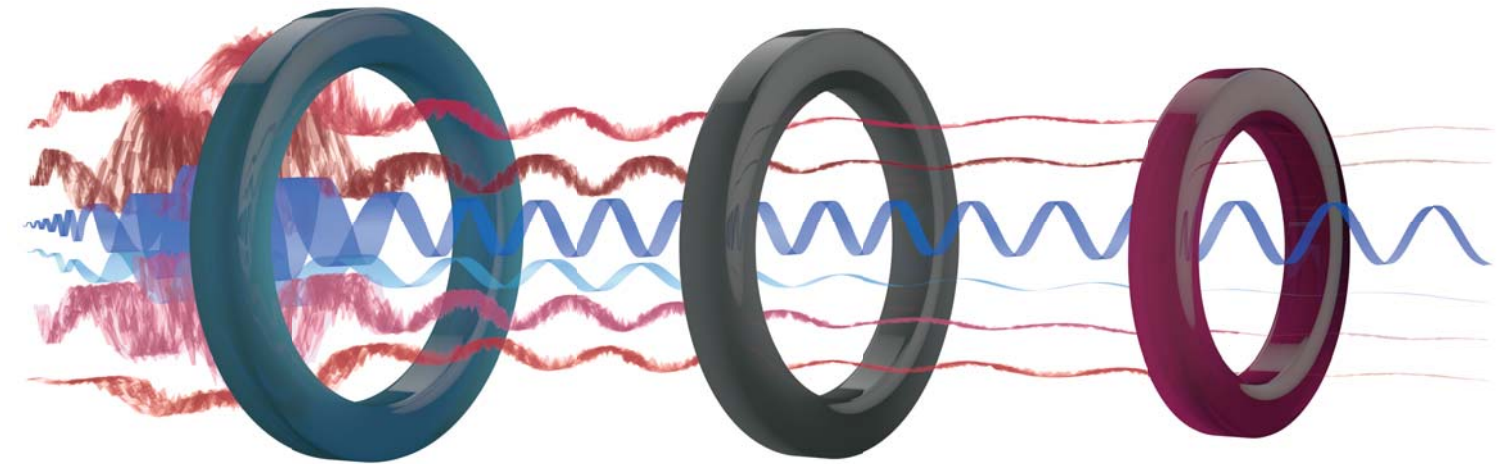
Organize, Select & Follow

Nature has endowed the auditory system with an ability to interpret sounds in a three-step process. First, it **organizes** the soundscape, an ability that is fundamental to speech understanding. This accomplished, the brain can then **select** the signal of greatest interest - such as human speech - while suppressing (but not eliminating) other sounds in the environment. It will then **follow** that signal over time.

The higher the signal fidelity the more relevant the information becomes, allowing the brain to organize, select and follow a particular sound source, such as a conversation in a noisy restaurant. And since each and every acoustic cue is meaningful and indeed synergistic, people with hearing loss must concentrate and work hard just to keep up.

If the signal is distorted; if acoustic components are missing, unclear, inaudible or degraded, the listener will be forced to spend more energy on organizing sound sources and resolving ambiguities in an already difficult listening situation. But when the information is natural and complete, the human brain effortlessly creates meaning out of acoustic chaos.

The brain's natural 3-step process of understanding speech



Organize

In a soundscape, the auditory system relies on spatial cues and other acoustic information in order to make sense of the many environmental sounds. The brain organizes various streams of sounds as identifiable percepts.

Select

When a soundscape is organized, the brain is able to select a particular sound source and ignore intrusive background noise. This ability is crucial; as well as allowing us to direct our attention to a particular person it enables us to switch our attention from one person to another; something we always do when interacting in a group.

Follow

When listening, the auditory system instinctively tunes into the individual characteristics of the voice in focus - i.e. level changes and stress patterns. The higher the fidelity and the better preserved the natural dynamics of the speech signal are, the easier it becomes to follow speech and ignore competing sounds. Any energy saved can then be channelled into other cognitive processes such as reflecting, remembering and responding.