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## Co-modulation Masking Release Begins in the Auditory Periphery

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### ABSTRACT

Understanding speech in noisy environments can be difficult, especially for people with hearing loss. The background noise can cover up the sounds of interest. Normally, the auditory system works to alleviate this problem by tagging and then cancelling the noise. Our experiments are aimed at understanding the mechanism of this noise cancellation process. We hypothesize that non-linear signal processing in the mammalian cochlea (the most peripheral part of the auditory system) is the basis of noise cancellation. To test this hypothesis, we measured the responses of auditory-nerve fibers (ANFs) to sounds embedded in background noise with different statistical properties. ANFs are typically categorized according to their spontaneous firing rate (SR) which covaries with many other aspects of their neural coding properties. We found that low-SR ANFs showed strong neural correlates of noise cancellation, whereas in high-SR ANFs the effect was much weaker. ANF responses support the hypothesis that cochlear non-linearities underlie noise cancellation in complex listening environments. The weakened non-linearities characteristic of the hearing-impaired cochlea could negatively impact listening in noisy places. Future improvements in the signal-processing algorithms for auditory prostheses may help restore better hearing in background noise.

### KEYWORDS

Auditory Nerve, Masking Release, Modulation, Critical Band, Two-Tone Suppression, Cochlear Non-Linearity.