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**Neural Circuitry and Mechanisms of Sound Intensity Coding**

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Recent studies revealed great diversity in the structure and function of afferent synaptic connections between the cochlear inner hair cell (IHC) and spiral ganglion neurons (SGNs), which likely enables audition over a wide dynamic range. To maintain a proper synapse gradient, both pre- and post-synaptic mitochondrial networks may undergo function-morphological adaptations owing to differential local energy demands and ion homeostasis. Utilizing volume electron microscopy and machine-learning-assisted image analysis [1,2], we report spatial arrangements and morphologies of mitochondria in the IHCs and SGNs of mice. Further, we show that disorganization of the mitochondrial networks is a hallmark of overstimulated cochleae (e.g. exposed to noise). This may contribute to a compromised morphological gradient of afferent synapses and IHC deafferentation, causing coding deficits of the cochlea.

References:

[1] J. Liu, S. Wang, Y. Lu, F. Wang, et al., *Neuroscience Bulletin*. 38(3):235-248 (2022)

[2] Y. Lu, J. Liu, et al., *iScience*. 27(2):108825 (2024)