Reduction of information redundancy in the ascending auditory pathway

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Abstract:

Information processing by a sensory system is reflected in the changes in stimulus representation along its successive processing stages. We measured information content and stimulus-induced redundancy in the neural responses to a set of natural sounds in three successive stations of the auditory pathway-inferior colliculus (IC), auditory thalamus (MGB), and primary auditory cortex (A1). Information about stimulus identity was somewhat reduced in single A1 and MGB neurons relative to single IC neurons, when information is measured using spike counts, latency, or temporal spiking patterns. However, most of this difference was due to differences in firing rates. On the other hand, IC neurons were substantially more redundant than A1 and MGB neurons. IC redundancy was largely related to frequency selectivity. Redundancy reduction may be a generic organization principle of neural systems, allowing for easier readout of the identity of complex stimuli in A1 relative to IC.

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