The architecture of speech perception and its temporal foundations

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The functional anatomy of speech sound processing is comprised of a distributed cortical system that encompasses regions along at least two processing streams. A ventral, temporal lobe pathway primarily mediates the mapping from sound input to meaning/words. A dorsal path incorporating parietal and frontal lobes enables the sensorimotor transformations that underlie mapping to output representations. To facilitate the processing along these different dimensions, sound is analyzed in temporal chunks that permit the appropriate computations in these pathways. Adopting (and adapting) Marr's (1982) approach to vision, and focusing on the implementational and algorithmic levels of description, I argue that the perception of speech requires a multi-time resolution analysis. In particular, recent experimental data from psychophysics, MEG, fMRI, and concurrent EEG/fMRI suggest that there exist privileged time scales that form the basis for constructing elementary auditory percepts. These 'temporal primitives' permit the construction of the internal representations that mediate the analysis of speech and other acoustic signals.