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The temporal analysis of spoken language

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The (concurrent) construction of syllabic and phonemic representations forms the basis for creating interpretable representations of speech; therefore we look here to temporal attributes commensurate with their acoustic implementation. Based on a distributed model of the functional anatomy of speech perception (Hickok & Poeppel 2007) and on the assumption that the perception of speech requires multi-time resolution analysis (Poeppel 2003), electrophysiological data are shown that illustrate how auditory cortex makes use of one specific temporal mechanism, the processing of phase (Luo & Poeppel 2007). We hypothesized that the phase pattern of cortical rhythms associated with modulation rates mediating intelligible speech provide an encoding mechanism. We observed that the phase of the theta band response generated in auditory cortex tracks sentence-level acoustics with the sensitivity and specificity necessary for neuronal encoding. The data are consistent with the view that a $\sim$200 ms temporal window (period of theta oscillation) segments the incoming signal, resetting and sliding to track speech dynamics. This hypothesized mechanism for cortical speech analysis is based on the stimulus-induced modulation of inherent cortical rhythms and provides supporting evidence implicating the syllable as a computational primitive for the representation of spoken language.