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From Speech to Language: Mapping the Auditory Comprehension Network

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Speech comprehension is a complex perceptual and cognitive task that is fulfilled in a surprisingly robust manner. I will present a series of studies that aim at disentangling the interaction of sensory/acoustic and cognitive/linguistic factors driving the speech comprehension system: (i) How does the system in its entirety deal with noise at the auditory entry level? (ii) Which are key contextual influences that aid speech comprehension when the signal quality drops, and (iii) what is the functional circuitry within and across auditory cortex that copes with comprehension difficulties?

Main results include: 1. Comprehension of intermediate signal quality based on semantic predictability engages a left- hemispheric, widely distributed array of brain structures. Also, functional connectivity amongst these areas appears enhanced. 2. Signal intelligibility gates and enables the expected semantic effects (cloze probability; BA44 BOLD response and EEG N400), whereas semantic effects shape the intelligibility modulation in anterolateral temporal cortex. 3. The angular gyrus (BA 39) enhances difficult yet successful speech comprehension whereas left posterior STG reflects higher computational effort (either poor signal quality or low cloze probability) in speech comprehension.

Behavioural, EEG and fMRI data will be presented, and themes of (bi-)laterality and bottom-up/top-down directionality will be re-visited along the way.