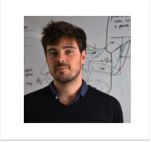

Probing supra-threshold hearing mechanisms to understand speech-in-noise intelligibility deficits

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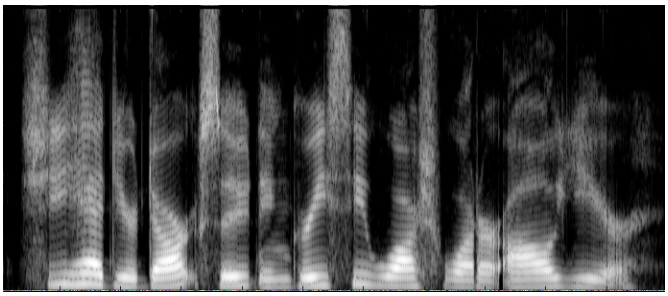
(séminaire donné en français)

Abstract – A largely unresolved problem in hearing sciences concerns the large heterogeneity observed among individuals with similar audiograms (auditory thresholds measured in quiet) in understanding speech in noisy environments. Recent studies suggest that supra-threshold auditory mechanisms (i.e. that operate above detection threshold) play a prominent role in these interindividual differences, but a precise view of where and how distortions arise along the auditory processing hierarchy is lacking. Addressing this problem requires novel approaches that not do simply consider hearing in terms of sensitivity, but in terms of fidelity of encoding. In this talk, I will present a novel methodological framework developed for this purpose, which combines signal-processing with psychoacoustical tests and computational modeling tools derived from system identification methods. I will present and discuss results from several experiments conducted in both normal-hearing and hearing-impaired individuals within this framework to characterize the processing of supra-threshold signals made of spectrotemporal modulations – broadband noises whose envelope is jointly modulated over time and frequency like – which constitute the most crucial feature underlying speech intelligibility. I will then explain how the detailed characterization returned from this joined experimental-modeling approach can be used to identify the different components underlying suprathreshold auditory encoding deficits. Overall, this project describes an innovative approach that capitalizes on acoustical and system-engineering methods to shed an unprecedented light on supra-threshold hearing and its disorders. By integrating the knowledge of how the auditory system operates above threshold in noisy conditions, this project will generate new avenues for the development of novel audiological procedures and signal-processing strategies for hearing aids.



The spectrogram of a speech sentence displays clear spectrotemporal modulations of energy. The intelligibility of this acoustical signal relies on the efficiency of the processing of these features by the auditory system.