Lecture on neuroimaging methods

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- **Topic:** What do different types of human brain imaging methods measure? What are their advantages and disadvantages?

- **Aim:** make you able to read and assess cognitive neuroscience articles without (too much) headaches.

Content:

- Intro to brain anatomy & function (revision?) followed by a panorama of electrical (iEEG, EEG, MEG, …) and metabolic methods (PET, NIRS, fMRI)

- Focus on fMRI

  - how are fMRI images obtained?

  - How to design and analyse fMRI experiments ? What are the possibilities and limits of the method?

- Evaluation: oral presentations of papers (10')

Uses of in vivo neuroimaging in humans

- neurosurgical planning

- investigation of the physiological basis of neurological diseases such as epilepsy, Alzheimer's, and stroke

- development of diagnostic methods, drugs, treatments, and interventions

- study of cognitive and perceptual responses and developmental changes.

We are going to visit a vast array of topics:

- Neurology & Cell biology

- Physics (Electromagnetism, Quantum mechanics)

- Signal processing

- Statistics

- Experimental psychology

But for all these topics, they are just a few 'take home' messages.

Methodology can be boring: I will illustrate the interest of methods with many examples of cognitive applications.

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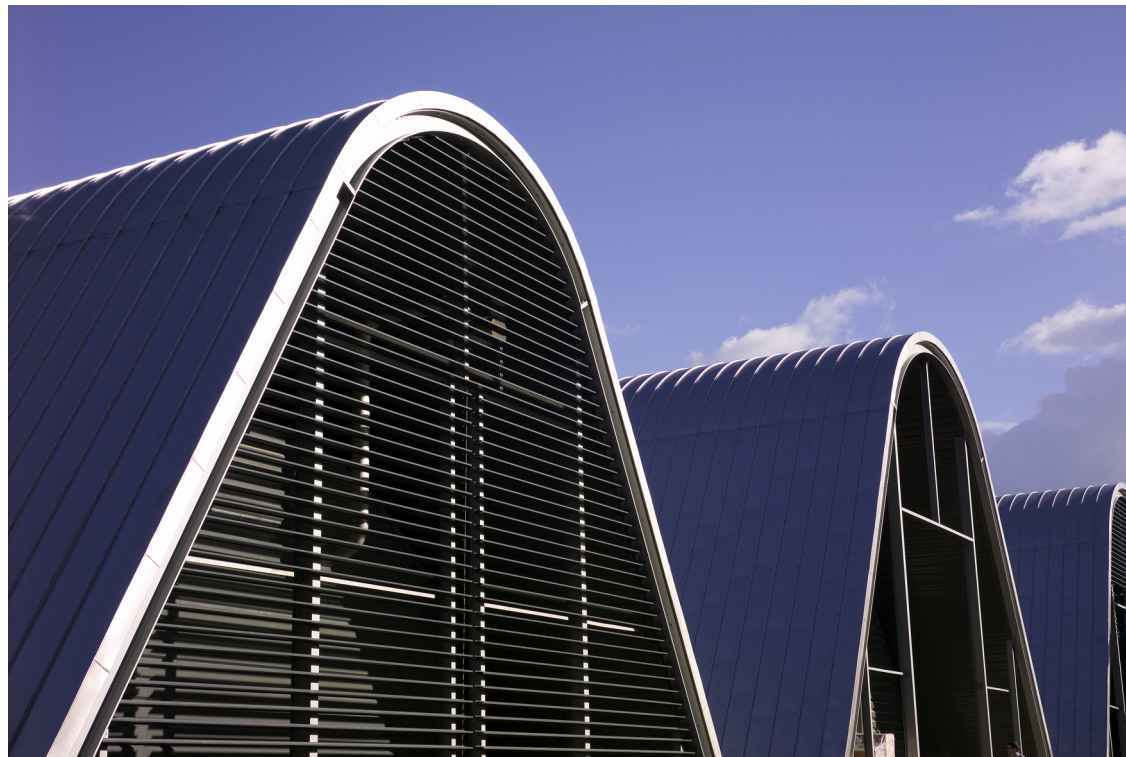
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Brain imaging of language

- Try and identify the cortical regions supporting the various stages involved in language processing (speech perception, word recognition, syntactic and semantic processing).

- What is the format in which the brain represents linguistic objects

- Address questions of shared or separate resources

  - Speech perception and production

  - Reading vs. speech processing

  - Language & Mathematics or Music

  - First and second language in bilinguals

- Search for cerebral correlates of individual differences, and pathologies (e.g. dyslexia, …)