

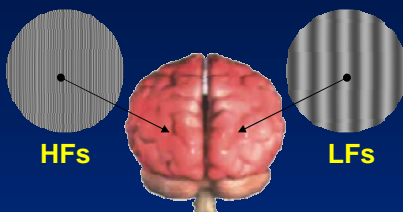
## Hemispheric specialization for spatial frequency processing in natural scene perception and Hemianopia (a case study)

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### The hemispheric asymmetry hypothesis



Right hemisphere (RH) => Low spatial frequency (LFs) processing

Left hemisphere (LH) => High spatial frequency (HFs) processing

#### Research aims

This functional hemispheric asymmetry hypothesis of spatial frequency processing had been inferred from data obtained with the hierarchical form paradigm, *without any explicit spatial frequency manipulation per se.*



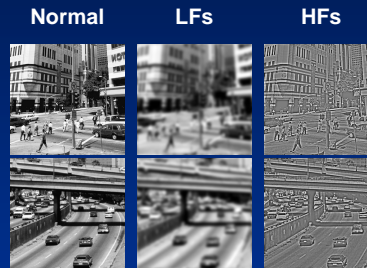
**Natural scene perception**



## Cognitive Psychology study - Experiment

Healthy subjects have to identify a target scene (a highway or a city):

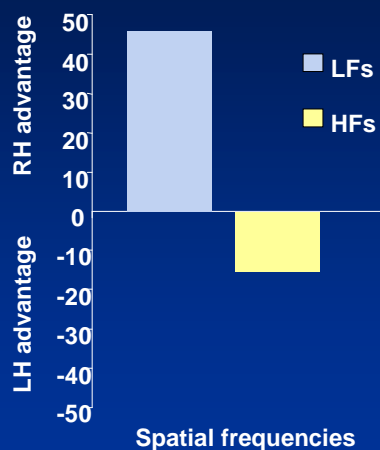
- ✓ Normal (non filtered) target scene
- ✓ Low spatial frequency (LFs) target scene
- ✓ High spatial frequency (HF) target scene



- ✓ Right visual field (left hemisphere)
- ✓ Left visual field (right hemisphere)



## Cognitive Psychology study - Results



→ Identification of LFs target scene was significantly faster in LVF (RH) than in RVF (LH).

→ Identification of HF target scene was significantly faster in RVF (LH) than in LVF (RH).

**This study confirmed the hemispheric asymmetry hypothesis by directly manipulating the spatial frequency of presented scenes.**

## Neuropsychological study

Recently, Pambakian et al. (2000) studied the natural scene processing of homonymous hemianopic patients and showed that only low filtered natural scenes recognition was more impaired in patients than healthy control subjects.

Therefore, these results suggested that the primary visual cortex should be at least involved in low spatial frequencies processing.



## A Case Study

## A case study - Experiment

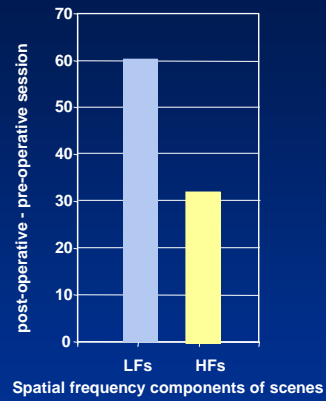
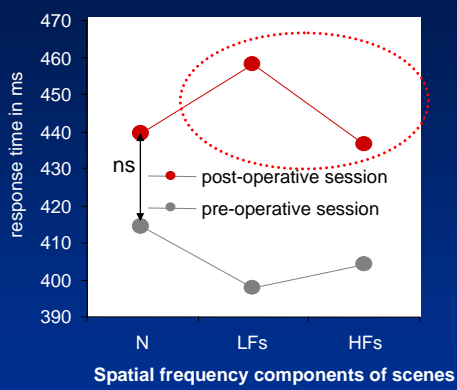
### Patient

Patient JM underwent an embolization of the right primary visual cortex. As a consequence, she suffered from a left homonymous hemianopia.

### Procedure

- The cognitive psychology study paradigm was presented to JM.
- The experimental paradigm was presented to JM on week before the intervention (pre-operative session) and six months after (post-operative session).
- The scenes were always presented in the healthy right visual field.

## A case study - Results



Only the filtered scenes were slowed after the intervention.

Low frequency target scene analysis was more impaired than high frequency target scene analysis.

## Conclusion

These results confirmed the role of the primary visual cortex in low spatial frequency processing.

### Research perspectives:

Test other hemianopic patients to add evidence to the hemispheric asymmetry hypothesis for spatial frequency analysis.