

# Functional magnetic resonance imaging of the human object-vision system : methodological and empirical contributions

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Stellingen bij het proefschrift

**Functional magnetic resonance imaging  
of the human object-vision system**

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**methodological and empirical contributions**

Nikolaus Kriegeskorte

1. The natural topological structure of the cortex should be used as an a-priori constraint in the construction of explicit representations of the cortical sheet.
2. The human motion complex represents not merely the visual motion flowfield, but also the spatial structure of the perceived three-dimensional surface.
3. The statistical methods currently dominant in neuroimaging analysis are based on the incorrect assumption that brain activity levels vary smoothly in space at the scale of centimeters.
4. Neuroscientific exploitation of the fine spatial structure of current high-resolution data from functional magnetic resonance imaging (fMRI) requires information-based statistical mapping techniques.
5. Single particular object images elicit distinct fMRI response patterns in early visual areas and inferotemporal cortex.
6. An individual-level representation of human faces is more likely to reside in anterior inferotemporal cortex than in the more posteriorly located fusiform face region.
7. More generally, physically similar visual objects are represented at the category level in posterior and at the individual level in anterior regions. For example, separate individual-level representations dedicated to zucchinis and egg plants exist in the inferior frontal and the midfrontal gyrus, respectively.
8. The identity of each particular object is represented by the activity of a particular neuron whose computational capacity is either naturally inferior or substantially diminished by aging: a so-called “grandmother cell”.
9. In a striking analogy between sensory and motor processing, the inferior computational capacity of grandmother cells is shared on the motor side by command neurons capable of triggering the execution of complex actions and, at an altogether different level of organization, by individual people elected to lead companies, research institutes, and nations.<sup>1</sup>
10. To ensure stability of operation in a complex system such as the brain or a nation, each unit’s connectivity—defining its position within the network and ultimately its degree of causal agency—should be inversely related to its individual talent and originality.

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<sup>1</sup>Grandmother cells undergo programmed death around the age of retirement. Their apoptosis triggers the development of more advanced distributed coding schemes in the first 12 months after retirement. The almost complete absence of grandmother cells in the brains of grandmothers explains the undisputed intellectual superiority of grandmothers in comparison to their children and grandchildren. Less biologically inclined theorists argue that grandmother cell death is not programmed but instead occurs as a consequence of the greater individual freedom experienced in retirement. As grandmothers cut themselves free of the professional social network that contains them, as they liberate themselves of the need to appear intellectually tame, they begin to grow the cognitive claws and fangs that all their lives lay latent within them. It is this natural blossoming of intelligence and originality which ultimately displaces the inferior neuronal coding scheme of grandmother cells.