GUY ORBAN
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Guy Orban was until 2011 Professor of Neurophysiology and director of the Laboratorium voor Neuro- en Psychofysiologie of the Medical school in Leuven, Belgium where he pioneered fMRI in the awake nonhuman primate, as the critical link between human fMRI and single cell recordings in nonhuman primates. He discovered the gradient selective neurons in FST and IT coding the first and second order gradients of speed or disparity, the basic features of 3D shape (3D orientation and curvature) and their localization in the human brain. Over the years he directed many PhD students, the second of which was Prof. B Z Gulyas. He has published over 290 papers in peer-reviewed journals and is a world expert in homologies between human and nonhuman primate brains. He is presently an invited researcher at the department of Neuroscience, Parma University where he holds an ERC grant to investigate the human brain mechanisms of observed actions, whether performed with natural or artificial effectors.

Five representative papers:

Orban GA. The extraction of 3D shape in the visual system of human and non human primates. Ann Rev Neurosci. 2011 34: 361-388

Vanduffel W, Zhu Q, Orban GA. Monkey cortex through fMRI glasses. Neuron 2014; 83:533-50

Peeters R, Simone L, Nelissen K, Fabbri-Destro M, Vanduffel W, Rizzolatti G, and Orban GA. The representation of tool use in humans and monkeys: common and uniquely human features. J. Neurosci 2009, 29: 11523-11539.

Abdollahi RO, Jastorff J, Orban GA. Common and Segregated Processing of Observed Actions in Human SPL. Cereb Cortex. 2013 23:2734-53

Ferri S, Rizzolatti G, Orban GA. The organization of the posterior parietal cortex devoted to upper limb actions: An fMRI study. Hum Brain Mapp. 2015; 36:3845-66

The role of posterior parietal cortex in action observation: Cultural and other human-specific factors

Posterior parietal cortex plays a critical role in action observation, the capability to perceive others' actions, the neglected part of visual perception. Discrimination of observed actions can be modeled by a diffusion process indicating that sensory evidence is provided by observed-action specific neurons. Direct evidence for such selectivity has been obtained both by fMRI, revealing observed-action specific single voxels, and by single cell recording revealing observed action specific neurons in phAIP. Hence observed-action coding is provided by a place code, the PPC regions corresponding to different observed-action classes, and a labeled line code within those regions for individual action exemplars of a given class. Different communicative actions classes involve different PPC regions: vocal communication several small regions in the angular gyrus, communicative hand actions phAIP, in what seems an evolutionarily ancient cultural recycling, and indirect communication by traces in the environment, prefiguring plastic arts, PF regions. Action observation has also close relationships to numerosity processing and mathematics, the latter involving PF, the former dorsal DIPSA, a putative homologue of VIP. As tool use also involves PF regions, these results point to the PF regions as major nodes in cultural and typically human behavior.