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Decoding the brain to read the mind

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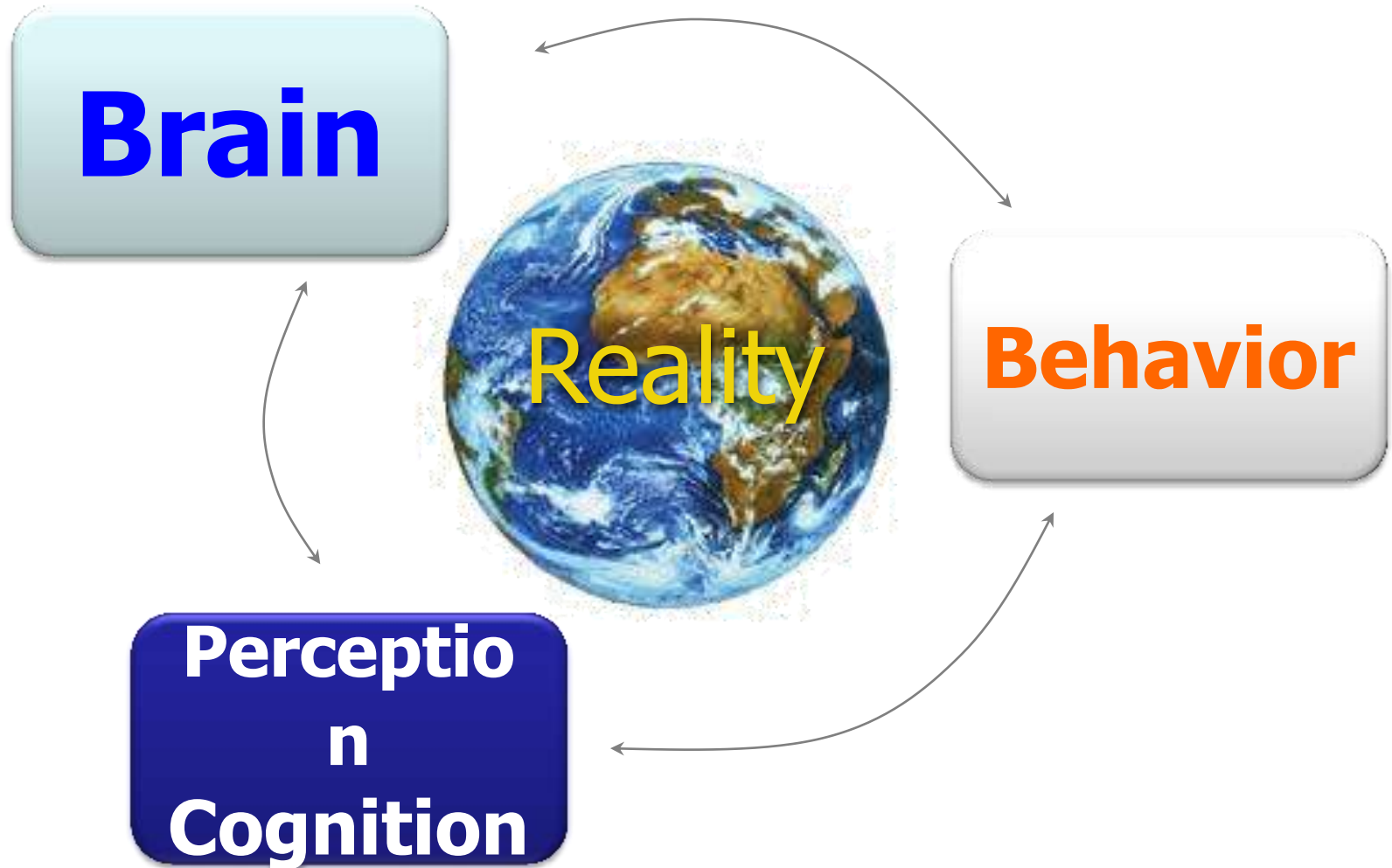
A.O.U.P & University of Pisa



MoMiLab
Molecular Mind Lab

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- The conceptual framework – How the Mind arises from the Brain



.... And the Collaborators

Molecular Biology Lab @ University of Pisa

- Silvia Pellegrini
- Caterina Iofrida
- Veronica Mariotti
- Erika Melissari
- Sara Palumbo

Research Center 'E. Piaggio' @ University of Pisa

- Antonio Bicchi
- Luigi Landini
- Enzo Pasquale Scilingo
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- Giovanna Marotta
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- Ron Kupers
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- Tomaso Vecchi
- Zaira Cattaneo

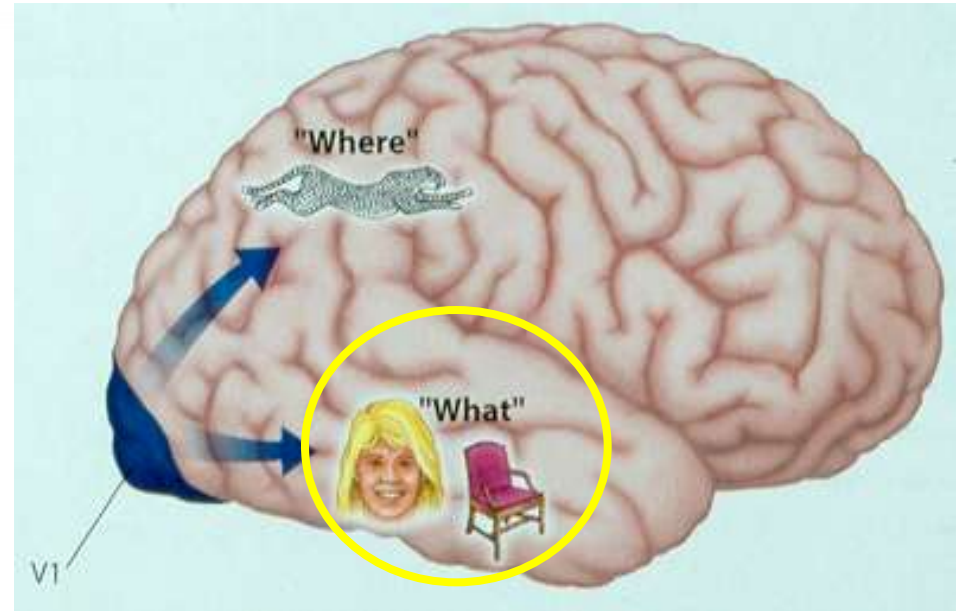
The Brainnetome - Chinese Academy of Sciences, Beijing, China

- Tianzi Jiang



WEARable HAPTics
for Humans and Robots

The world in the brain

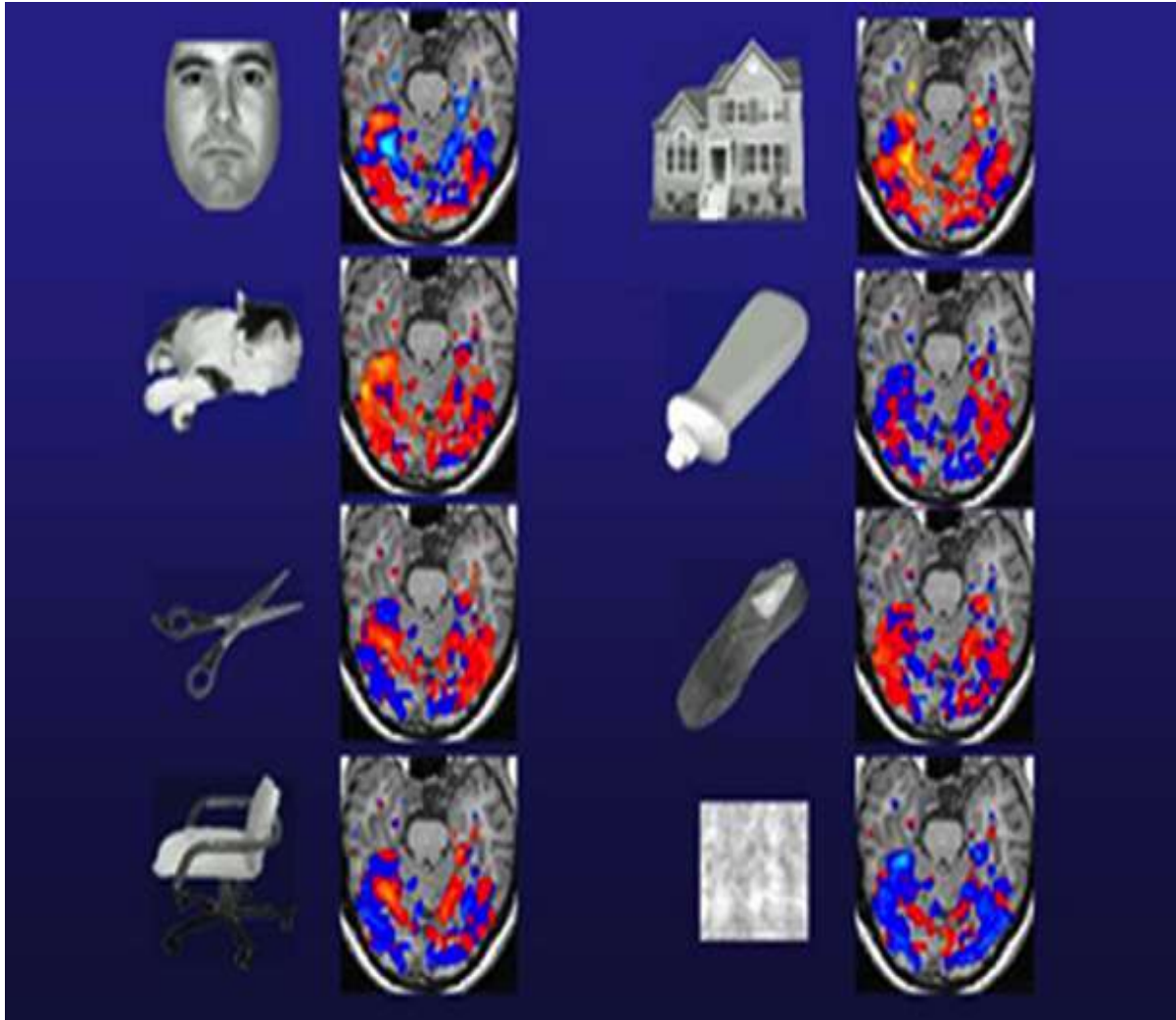


How does the human brain represent distinct object categories?

Faces, houses, animals, tools...

Haxby... Pietrini, Science, 2001

The world in the brain – *Object Form Topology*

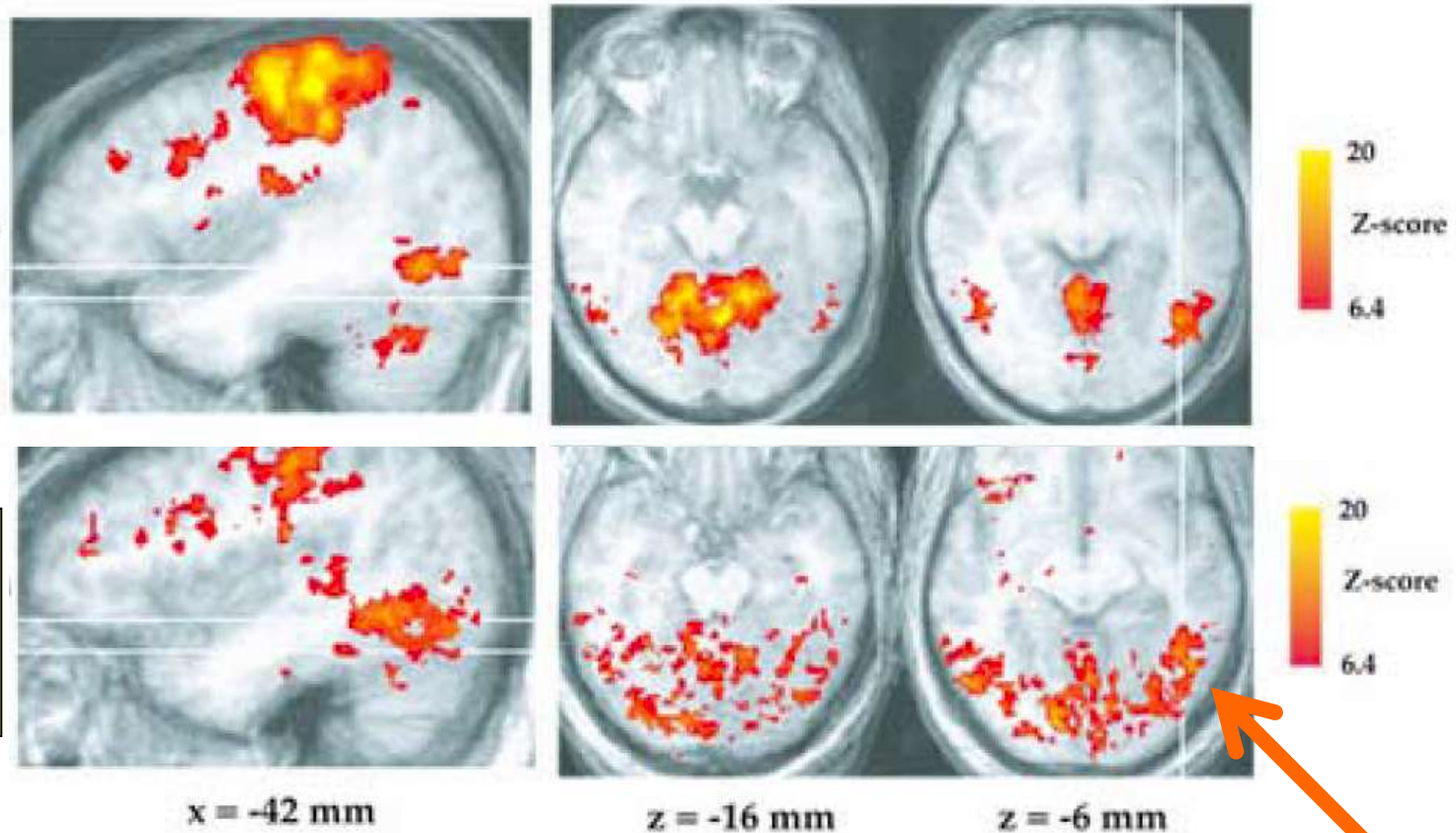


Different object categories elicit distinctive patterns of neural response for each object category across the ventro-temporal association cortex

The brain morphological and functional architecture does not require visual experience

Object Form Topology responds also to non-visual stimuli - *Supramodality*

Sighted
Subjects



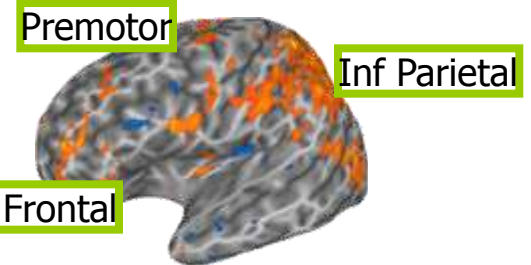
Congenitally
Blind
Subjects

The Supramodal Social Brain: Mirror System

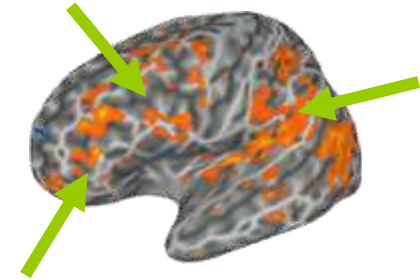
Sighted



Visual

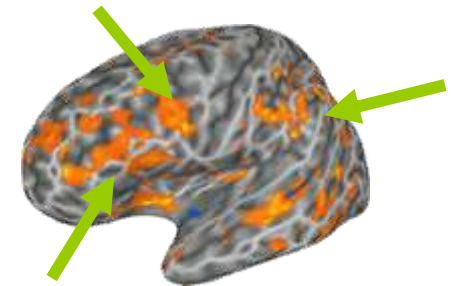


Auditory



Blind

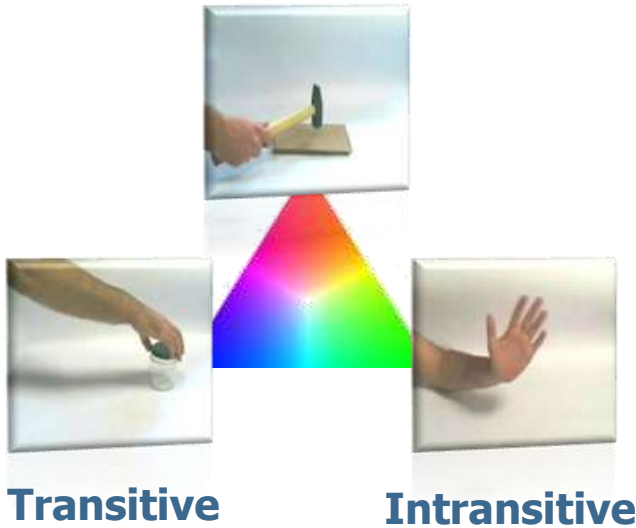
Auditory



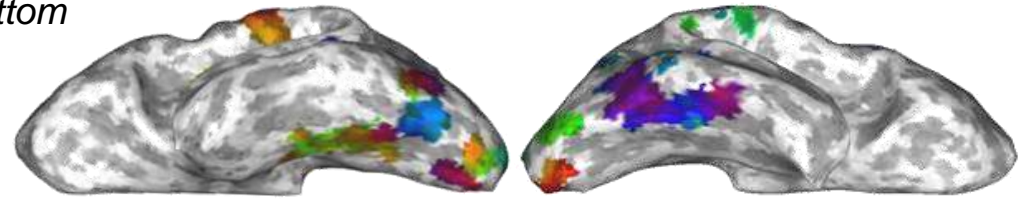
- A more abstract, visual independent representation of action concepts in the human brain

Decoding the Neural Code of Thoughts

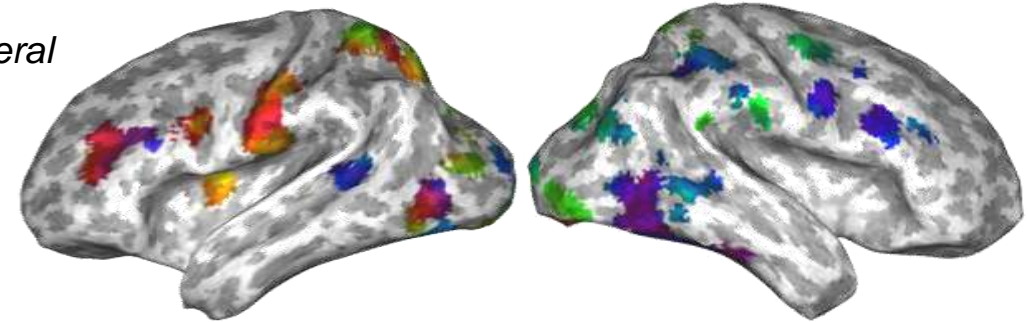
Tool-mediated



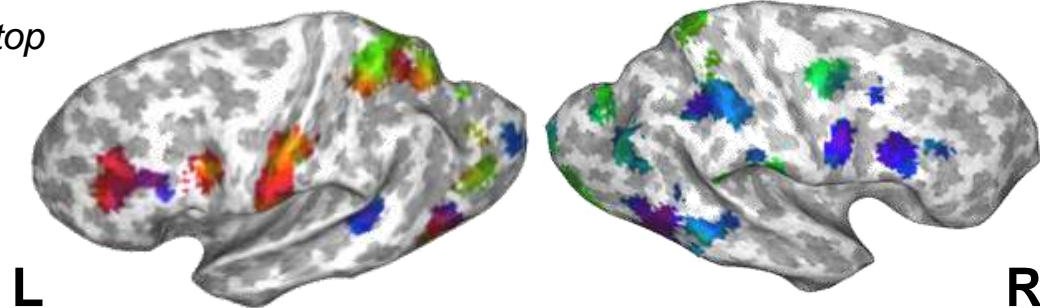
bottom



lateral



top



A machine learning classifier recognizes whether subjects are observing an 'action' (94% accurate) and which kind of action (about 85% accurate)

Toward a Biochemistry of Mind?

It was not long ago that psychiatric disorders were grossly classified as “organic” and “functional” according to whether there was a known brain structural alteration (e.g., dementia) or not (e.g., depression or schizophrenia). This merely reflected our inability to go beyond what could be visible to the naked eye in the brain. Functional brain studies and genetics have given us a powerful microscope to dissect the intimate molecular aspects of brain function. As clinicians, we ought never forget that the human mind may express itself through a chain of molecular processes, but it is not just a matter of molecules.

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