

# Intersubjectivity and the Extended Mind

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## Outline:

- The extended mind hypothesis
- Challenge to the extended mind
- Intersubjectivity to the rescue?

# What is extended mind?

"...we will argue that *beliefs* can be constituted partly by features of the environment, when those features play the right sort of role in driving cognitive processes. If so, the mind extends into the world." (Clark & Chalmers 1998)



# Extended Mind

Active externalism/ enabling externalism / “how” externalism/  
vehicle externalism (Hurley, Rowlands)

“...*how*- by what processes or mechanisms or ‘vehicles’- mental states are enabled....  
What are the boundaries of the relevant enabling processes?  
Can enabling processes extend beyond exclusively internal neural processes into the body and its environment? Enabling externalism (or how-externalism, or vehicle externalism) answers ‘yes’”. (Hurley, “Varieties of Externalism”)





# Why be a vehicle externalist?

- Thought experiments: (Clark & Chalmers 1998), Otto and his notebook
- Artefacts: E.g. filofax, iphone (Chalmers 2008), instruments like the nautical slide rule (Hutchins 1995), “epistemic artefacts- tools for thinking” (Sterelny 2004)
- Robotics & Artificial Intelligence: Ballard et al. 1997, Fitzpatrick et al. 2003, Kuniyoshi et al. 2004, Collins et al. 2005, Pfeifer & Bongard 2007

## BABYBOT

‘Learning’ object boundaries  
by co-ordinated sensorimotor  
interaction with the environment  
(Fitzpatrick et al. 2003)



# Challenge to the extended mind

“...I think that there is one potentially principled place where the opponent of the extended mind can resist. **This is an appeal to the dual boundaries of perception and action.** It is natural to hold that perception is the interface where the world affects the mind, and that action is the interface where the mind affects the world. If so, it is tempting to hold that what precedes perception and what follows action is not truly mental.”  
(Chalmers 2008, xi)

‘Classical sandwich’ view of mind:



# Intersubjectivity to the rescue?

## Perception-action coupling in intersubjectivity:

“In most intersubjective situations we have a direct understanding of another person’s intentions because their intentions are explicitly expressed in their embodied actions and their expressive behaviours.” (Gallagher & Zahavi, 2008)

We are “coupled” to other intentional agents via perception-action coupling

“Intentional attunement” (Gallese, 2005)

## Identified mechanism of perception-action coupling at the sub-personal level:

Mirror neurons (Gallese et al. 1996, Rizzolatti et al. 1996)

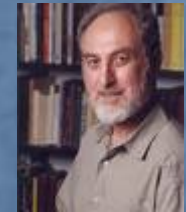
What exactly does the mirror neuron system code for in enabling the observed perception-action coupling which leads to intentional attunement in intersubjective situations?



# Two potential candidates defending perception-action interdependence in intersubjectivity :

## 1) Simulation theory

(Gallese & Goldman 1998,  
Goldman 2006)



## 2) Non-simulationist approach

For example, Interaction theory (IT)  
(Gallagher & Zahavi 2008,  
Gallagher 2008)



- 1) Simulation theory (Gallese & Goldman 1998, Gordon 2001, Goldman 2006):

Mirror neurons constitute “an automatic, unconscious, and pre-reflexive functional mechanism, whose function is the *modeling [simulation]* of objects, agents, and events” (Gallese 2005)

# Simulation and Vehicle Externalism:

Hurley (2008): Shared Circuits Model

Shared processing resources for perception and action provides the basis for the shared dynamics of self and other

Purports to provide a robust externalist picture of the mind and discusses in detail the functional mechanism of simulation by grounding it in the sensorimotor dynamics of the agent and the environment

# Action understanding as simulation:

Control theory + Offline copying

(for understanding both instrumental and expressive action)

“Offline mirroring simulates in the observer the causes of observed action, reversing the direction of simulative prediction: Instead of simulating feedback that would result from motor activations, mirroring simulates motor activation that would produce results similar to those observed, with actual motor output inhibited....

In effect, *offline copying* enables action understanding.”  
(Hurley 2008, emphasis added).



# Problems for vehicle externalism:

Off-line copying → Can be run entirely on internal models

Gallese (2004), Simulation is "...the brain's ability to generate **internal and environment-independent** duplicates of the properties of external objects/events."

# Grush (2004): Emulation theory

If there is an emulator available to the controlling system then the controller (e.g. the brain) while being “plug-compatible” with the body can also decouple from it and instead function by coupling with the emulator

In principle, makes the brain a potentially self-contained system

(Grush 2003, “In Defense of Some ‘Cartesian’ Assumptions Concerning the Brain and Its Operation”)

Applying the emulation framework for action understanding:  
Simulate = “...creating an emulated surrogate environment situation” (Grush 2004)

But...

“Could my mental states be partly constituted by the states of other thinkers? We see no reason why not, in principle....What is central is a high degree of trust, reliance, and accessibility” (Clark & Chalmers 1998)

So coupling between intentional agents [“intentional attunement”] can create an extended cognitive system

But a simulationist mechanism of securing “intentional attunement” via action understanding may not ground it

?? So what could be an alternative mechanism ??

# A non-simulationist approach

## Interaction Theory (IT):

- “ Mirror activation, on this interpretation, is not the initiation of simulation; it’s part of a **direct intersubjective perception** of what the other is doing.” (Gallagher & Zahavi 2008)
- IT (1): Mirror neurons [perception-action coupling mechanism] constitute a *sensorimotor resonance process*
  - IT (2): The sensorimotor resonance mechanism *underlies the perceptual process that enables action understanding*
  - IT (3): Action understanding is a matter of *direct intersubjective perception* enabled by sensorimotor resonance process



# Support for vehicle externalism?

“Rich”, “smart” perception (Gallagher 2008)

Mechanism of action understanding for securing intentional attunement is rooted in the intersubjective world and in the embodied agent’s real-time interaction with it

A perceptual mechanism of action understanding secures the constitution of one’s mental states by the states of other intentional agents, thereby creating an extended cognitive system in intersubjectivity

# Mechanisms of action understanding and extended mind

- Simulationist /Emulationist mechanism of action understanding:

?? Real-time sensorimotor engagement with the world / Mind leaking into the world??

“Covert, fully neural route”

- Perceptual mechanism of action understanding:

Identifiable on-going sensorimotor engagement

More direct route for mind to leak into the world

For example: Vision

“...Saccades are an action system in that they are a visually controlled motor response. However they are not just this, since their operation controls the input visual sampling also. Their involvement with vision takes the form of a continuously cycling loop, so that vision and cognition can integrate in an intimate way.” (Findlay & Gilchrist 2003)

Critical cognitive contributions of sensorimotor exploratory behaviour, such as eye movements, in perception:

- Task-specific
- Goal-directed
- Stimuli-disambiguating
- Perceptual-features-integrating
- Problem-solving

# Some instances of extended cognitive systems

- Gestures: Goldwin-Meadow (2003), McNeill (2005), Gallagher (2005) → gestures as processes of thinking

Sensorimotor resonance:

“...one’s own gestures [activate] the part of the brain that responds to intentional actions, including gestures, by someone else, and thus treats one’s own gesture as a social stimulus” (McNeill 2005, 250)



Gestures:

## Alač & Hutchins (2004) → group interaction as cognition

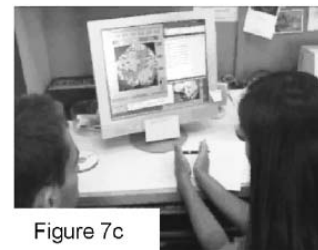
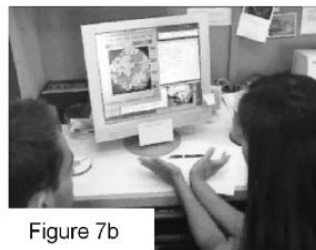
Scientists interacting: Expert and novice discussing a complex fMRI image, learning to see retinotopically organised areas on maps of the human cortex

### EXCERPT 2

4 E: So take these two meridians and as just  
5 as if you were squeezing them together into the pie shape



((stretches arms wide apart and then brings them together on the paper))



((slowly tilting wrists back and then bringing palms together))

Figure 6.

(Alač & Hutchins, 2004, 642)

## 2. Facial expressions in emotions:

### Sensorimotor resonance

Adolphs (2003), Gallese (2005) → “Experiencing disgust and witnessing the same emotion expressed by the facial mimicry of someone else both activate the same neural structure...” (Gallese, 2005, 39)

Cole (1998, 2001, 2009) → facial expressions in interpersonal relations

### Möbius syndrome (facial paralysis)

“...without the feedback and reinforcement between people that facial gestures provide, there was little relatedness and engagement. Her loss of facial responsiveness made her feel somehow invalidated at her very core.” (Cole 1998, 10)

Impairment in facial expression recognition in Möbius syndrome (Calder et al. 2000)

'Human-Robot Interaction' devised at the Bristol Robotics Laboratory (BRL), run by the University of Bristol and the University of West of England.



Jules is the first humanoid robot who can realistically mimic a real person's expressions in real time merely by watching their face

[Perceptual input fusing with motor plans in real time, dynamic perception-action coupling]



Peter Jaeckel, working on Jules at his lab in Filton, Bristol



# Intersubjectivity and Extended Mind:

- Intersubjectivity enabled by robust perception-action coupling of a perceptual non-simulationist variety can ground a robust extended mind approach

## Questions:

What exactly goes on in the “rich”, “smart” perception for action understanding?

What is the content of the perceptual state?

Extended mind: Where is the mind?

Extended cognitive systems in intersubjectivity:  
Where to look for the “person” in cognitive science?



# Thank you!



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