

Writing As Thinking

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The Manipulation Thesis

- “[C]ognitive processes are not located exclusively in the skin of cognising organisms because such processes are, in part, made up of physical or bodily *manipulation* of structures in the environments of such organisms.” (Rowlands 1999: 23)



The Manipulation Thesis

- Note that there is a locational aspect to this claim, that cognitive processes are not exclusively located in the body.
- This is underwritten by a constitutive claim that cognitive processes are, in part, constituted by the bodily manipulation of structures in the environment.

Cognitive Integration: My View

- The thesis is that cognition involves the integration of internal non-classical vehicles and processes - like those commonly found in neural networks - with external classical vehicles and processes - with obvious examples being written and spoken language, diagrams and mathematical symbols.
- So, for example, the integration of internal and external vehicles and processes together constitute the process of remembering. Explaining this integration of the internal and external involves both a dynamical account of the reciprocal causal interaction between internal and external vehicles and processes; and an account of how we learn to manipulate external vehicles in accordance with relevant cognitive norms.

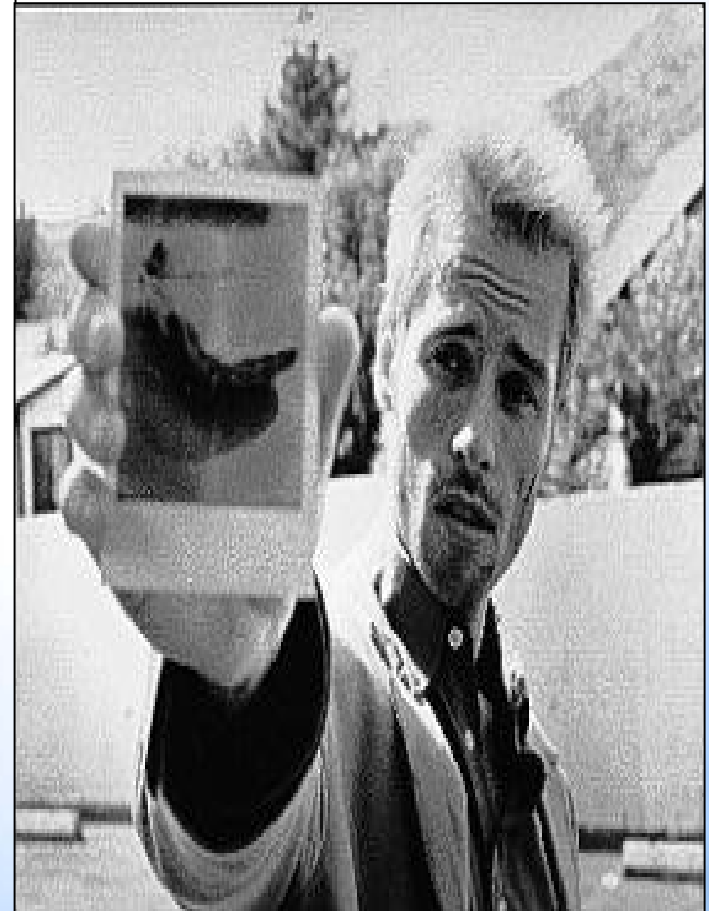
Cognitive Dynamics – The Extended Mind

- “cognitive processes ain’t (all) in the head!” (Clark and Chalmers 1998)



Cognitive Dynamics – The Extended Mind

- The Otto case, extended memory.
- Take the Otto example. In the case of Otto (an alzheimer's sufferer) and Inga (normal working memory) there is a sufficient *functional similarity* between Otto's use of his notebook and Inga's recall from biological memory, that we are inclined to say that the causal role that Otto's retrieval of information concerning the location of MOMA in producing behaviour – his going to 53rd street - is sufficiently similar to the pattern of activation in a part of Inga's brain which causes her to go to 53rd street.
- As such the physical implementation of the causal role is irrelevant to the functional level of description – Otto's use of his notebook and Inga's pattern of activation in her brain.



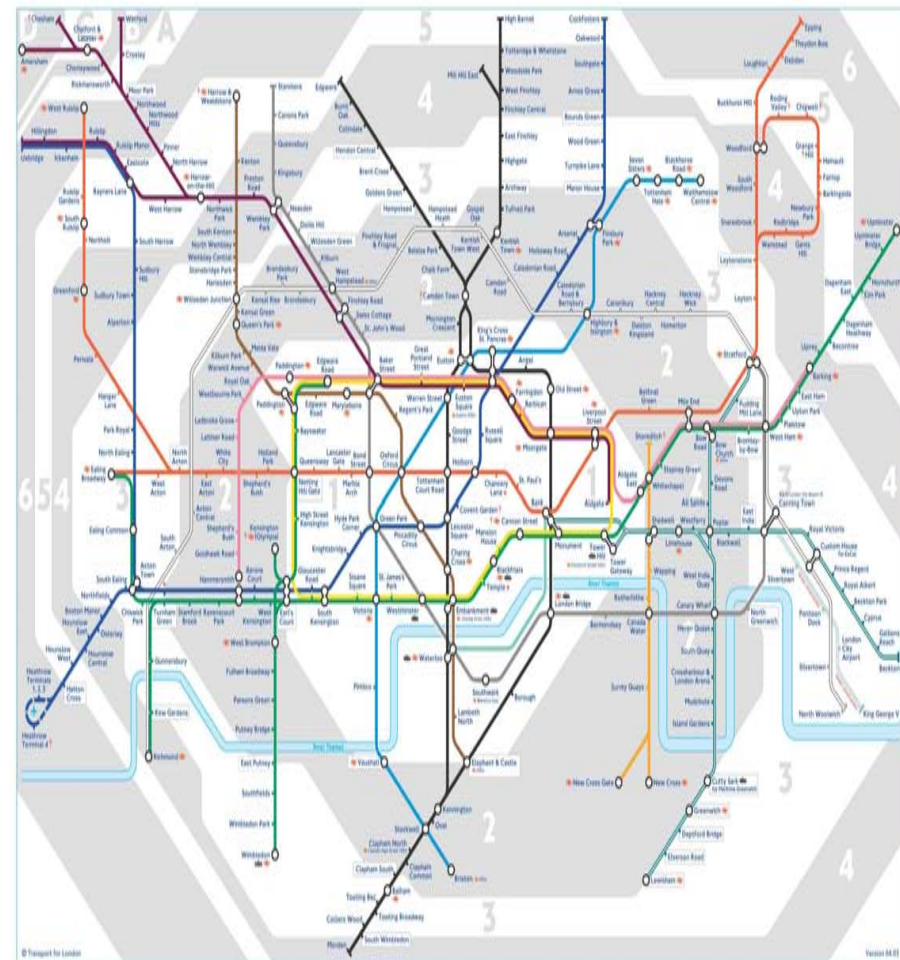
Cognitive Dynamics – The Extended Mind

- “In these cases, the human organism is linked with an external entity in a two-way interaction, creating a coupled system that can be seen as a cognitive system in its own right.” (Clark and Chalmers 1998, 9)
- “In all these cases the individual brain performs some operations, while others are delegated to manipulations of external media. Had our brains been different, this distribution of tasks would doubtless have varied.” (Clark and Chalmers 1998, 8)

Types of Manipulation

- We can identify at least three classes of manipulation:
 1. Biological coupling (such as animate vision).
 2. Epistemic Actions - using the environment as its own representation, obviating the need for internal representations (as in Tetris).
 3. Cognitive Practices (The manipulation of external representational /notational systems regulated by cognitive norms, as in mathematics).

External Representations



Key to lines † Points to remember

Bakerloo	Special fares apply for single and return tickets to and from Harrow & Wealdstone.
Central	No service Woodford - Harrow after 2000 daily.
Circle	Canon Street open until 2100 Mondays to Fridays. Closed Saturdays and Sundays.
District	Canon Street open until 2100 Mondays to Fridays. Closed Saturdays and Sundays. Earl's Court - Kensington (Olympia) 0700 to 2345 Mondays to Saturdays. 0800 to 2345 Sundays.
East London	Shoreditch - Whitechapel open 0700 to 1000 and 1530 to 1900 Mondays to Fridays. Closed Saturdays. Open until 1500 Sundays.
Hammersmith & City	No service Whitechapel - Barking early morning or late evening Mondays to Saturdays or all day Sundays.
Jubilee	
Metropolitan	For Cheam, change at Chalfont & Latimer on most trains. On Sundays between 1300 and 1730, Camden Town is open for interchange and exit only.
Northern	No entry to Covent Garden on Saturdays between 1300 and 1700. Heathrow Terminal 4 open until 2345 Mondays to Saturdays and 2315 Sundays. No service Uxbridge - Rayners Lane in the early mornings.
Piccadilly	
Victoria	
Waterloo & City	0615 to 2130 Mondays to Fridays. 0800 to 1830 Saturdays. Closed Sundays.
DDL&M	
National Rail	Single and return tickets issued for Underground/DLR journeys are not valid between Gunnersbury-Stratford or Custom House-North Woodchapel.

Certain stations are closed on public holidays.

Key to symbols

- Interchange stations
- Connections with National Rail
- Connections with riverboat services
- ✈ Airport interchange
- Connection with Tramlink
- Closed Sundays
- Served by Piccadilly line trains early morning and late evening

Explanation of zones

D	Stations in Zone D
C	Stations in Zone C
B	Stations in Zone B
A	Stations in Zone A
E	Stations in Zone E and Zone A
F	Stations in Zone F
G	Stations in Zone G
H	Stations in Zone H
I	Stations in both zones
J	Stations in Zone J
K	Stations in both zones
L	Stations in Zone L

- Allow us to complete Cognitive tasks, that would otherwise be difficult, or impossible.
- Allow for manipulations and transformations that would be difficult or impossible if attempted in the head.

Variety of External Representations

- “Algebras, alphabets, animations, architectural drawings, choreographic notations, computer interfaces, computer programming languages, computer models and simulations, diagrams, flow charts graphs, ideograms, knitting patterns, knowledge-representation formalisms, logical formalisms, maps, mathematical formalisms, mechanical models, musical notations, numeral systems, phonetic scripts, punctuation systems, tables and so on.”
(Peterson 1996, 7)

Merlin Donald – External Symbol Systems

Episodic culture

Mimetic culture

Linguistic/mythic

Theoretic culture/
ESSE

← Homo erectus

← Homo sapiens

← 5000 and less years ago

External Memory Fields

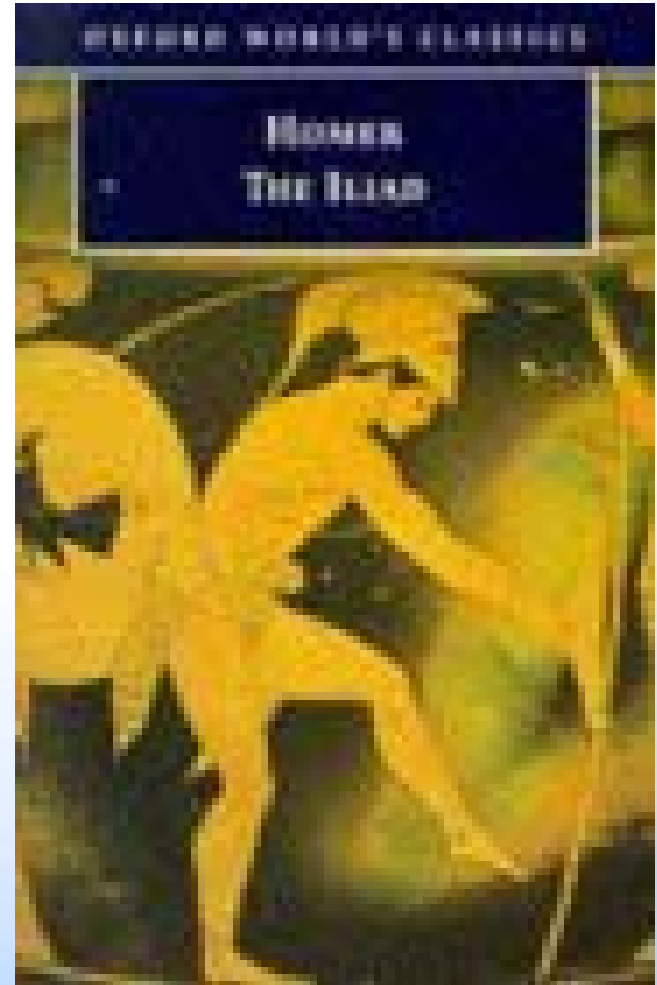
- Among other typical features, Donald points out that exograms last longer than engrams, have greater capacity, are more easily transmissible across media and context, and can be retrieved and manipulated by a greater variety of means (1991:315-6).

External Memory Fields

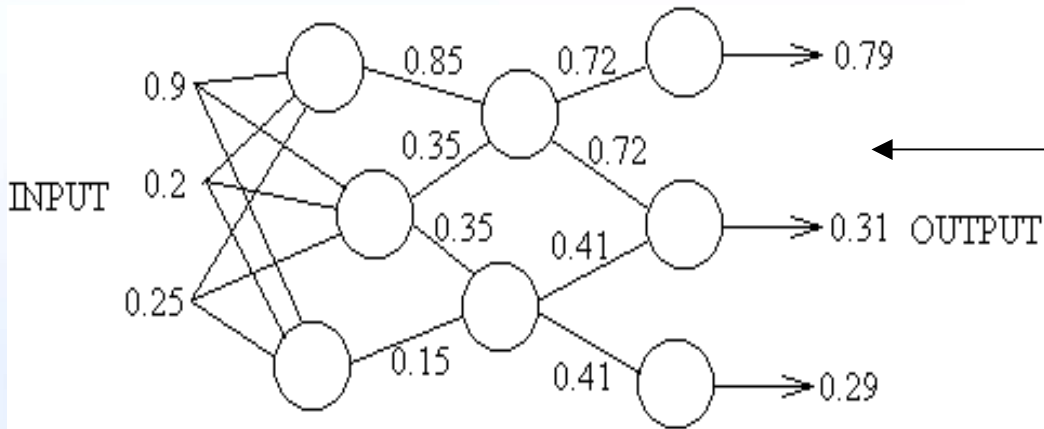
- “The storage and organization of information in Otto’s notebook is, in Donald’s terms, typically exogrammatic. Notably, information is stored there in discrete fashion, and representations in the notebook (linguistic or pictorial representations, for example) have no intrinsic dynamics or activity, are not intrinsically integrated with other stored information, and do no cognitive work in their standing or dispositional form. Representations in Inga’s biological memory, in contrast, may well blend and interfere: according to connectionist accounts of memory, for example, non-occurrent standing representations, ‘stored’ superpositionally in a single network’s weight matrix, influence processing continually in a holistic fashion and are themselves subtly shaped by this ongoing history (McClelland and Rumelhart 1986). *This* dissimilarity, unlike the other superficial dissimilarity, matters.” (Sutton, forthcoming)

Mythic To Written Symbolic

- Linguistic (oral)/mythic culture moving towards a symbolic written culture.
- Ideal form of semantic exogram.

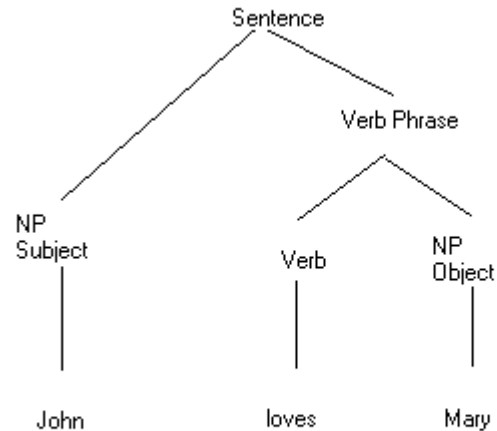


Cognition is Hybrid



Internal vehicles and processes

External vehicles and processes



- Repeatable tokens?



The Supracommunicative View of Language (Clark)

- The fundamental idea is that language plays not only a role in communicating ideas from one person to another, but also plays a role in facilitating thinking. This latter role, Clark calls “supra-communicative”.
- 1. Communicative role is more fundamental, and supra-communicative role is dependent upon it.
- 2. The two roles are equally fundamental. They may interact in complex ways. An instance of language use might show aspects of both roles that language plays.
- 3. The supracommunicative role is more fundamental than the communicative role, and communication is dependent on it.

An Example from Vygotsky

A four and a half year old girl was asked to get candy from a cupboard with a stool and a stick as tools. The experiment was described by Levina in the following way (his descriptions are in parentheses, the girls speech is in quotation marks):

(Stands on a stool, quietly looking, feeling along a shelf with stick). “On the stool.” (Glances at experimenter. Puts stick in other hand) “Is that really the candy?” (Hesitates) “I can get it from that other stool, stand and get it.” (Gets second stool) “No that doesn’t get it. I could use the stick.” (Takes stick, knocks at the candy) “It will move now.” (knocks candy) “It moved, I couldn’t get it with the stool, but the, but the stick worked.”

Clark's Six Ways

- i. Memory Augmentation.
- Notes, diaries, books.

- ii. Environmental Simplification.
- Use of labels to reduce searching.

- iii. Coordination and the Reduction of On-Line Deliberation.
- Planning explicitly, organizing things in a “to do” list. (not dependent on episodic memory) Can coordinate collaborative action. Don’t need to re-visit each step.

- iv. Taming Path-Dependent Learning.
- Language allows for generality breaking away from the specific circumstances in which we learned something to apply concepts/categories more generally to a wide range of circumstances.

- v. Attention and Resource Allocation.
- Externalization of control loops (e.g., the child's recitation of times tables). Vygotsky egocentric speech in problem solving.

- vi. Data Manipulation and Representation.
- Writing things down, or uttering them in public, allows the ideas to be rearranged and sorted into a new ordering.
- Brainstorming involves getting as many ideas out as possible. Then ideas can be compared and contrasted, taking into account different perspectives.

Problem 1: Normativity

- The external vehicles that are manipulated are *inscriptions*, on paper, blackboard, monitor, etc.
- These inscriptions have a variety of properties that allow them to be manipulated and interpreted (to have significance) in the ways that interest us.
- Inscriptions are structured in terms of a spatial arrangement on a page, monitor, etc. The inscriptions can be complex, having parts in which case there will be spatial relationships between these parts.
- Inscriptions are manipulated in terms of this structure. The inscriptions might be transformed, composed, or combined in various ways.

- The first wave of extended mind arguments are committed to the following claim which is, by itself, insufficient:
- *An account of such manipulations will be given in terms of the causal interaction between the cogniser and his/her environment.*

The Causal Dynamical Account on Its Own Won't Do

- If I give you a causal-dynamical explanation of my manipulation of numerals on a page then, I will not have told you anything about the purpose of those manipulations, nor will I have told you why this series of manipulations, as opposed to any others produces the desired product, why it is right.
- Nor will I be able to tell you why I *ought* to have done it this way, rather than another. Recognition of this feature of higher cognition, should lead us to recognise that we require not only causal explanations of the complex interactions between brain, body and environment, but also normative ones as well.

Cognitive Norms

1. Purposive norms. The activity of manipulating notations is engaged in for a purpose, or end.
2. Manipulative norms. Norms for manipulating inscriptions of a notational system.
3. Corrective norms. Norms for correcting the manipulation of notations in pursuit of an end.
4. Interpretative norms. Norms for interpreting inscriptions of a notational system as having some wider significance, not just within the notational system itself but also with regard to the wider world and interests of others.

Problem 2: Does The Supracommunicative View Turn Language Into a Fixed Code?

- For Harris, a sign has no continuous identity outside the contextualization that brought it into existence (Harris, 2000, p. 82).
- Written signs have the same ephemerality as speech?
- Love (2004), signhood is a transient, not a permanent, property of a sign.
- But the address for MOMA in Otto's notebook 'appears' to be stable and independent of context?

- However, there is a distinction between communicative acts that are created on the fly and written sentences that can be returned to and manipulated and interpreted in a variety of ways.
- The properties of written symbols (Donald) differ from those of utterances in important ways and it is these properties that make them useful to us.

No Need To Worry

- The variety of forms of representation is a result of the variety of tasks to which we put them (Peterson 1996):
- To draw inferences from the form of representation
- To explore and develop an idea
- To land an aeroplane
- To determine a transport schedule
- To transcribe or re-arrange a piece of music
- To develop a scientific theory with predictive properties

- Cognitive norms and representational formats are open-ended and flexible
- They exhibit developmental plasticity
- They are not fixed laws, nor objective, fixed codes

Why We Are Special

- “In particular, I will maintain that we do not find the basis of human oddness by looking *inside* the human phenome or genome (except in a trivial sense that was never the issue that excited debate). Rather, human specialness is ecological.” (Don Ross, 2005)