THE LANGUAGE OF THOUGHT HYPOTHESIS

PHIL351

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READINGS

Cain, Chapter 2, §§1-3

Optional:

Fodor, The persistence of the attitudes'

Bermudez, Ch. 8 (pp. 203-210)

PLAN

- Review
- continue with Marr
- Transition to the language of thought hypothesis

REVIEW

- Poverty of stimulus arguments
  - Traditionally used to motivate nativism over empiricism (e.g., Chomsky's universal grammar over accounts of language acquisition in terms of general learning principles)
  - As used by Marr, POS motivates postulation of biases/assumptions in the visual system about the distal environment.
- Granting built-in biases/assumptions lets us view a cognitive system's task in terms of the computation of a function (a precise input-output mapping).
  - Language learning = tuning the UG to the specific parameters of one's linguistic environment;
  - Vision = calculate the probable distal cause from its effect (i.e., proximate retinal stimulation)
- top-down analysis: Marr's computational, algorithmic, implementational levels.

THE PROCESSING HIERARCHY

Marr analyzed the overall task of the visual system into a structured series of sub-tasks or 'processing stages': early, middle, and late

Name	*Purpose*	*Primitives*
Image(s)	Represents intensity	Intensity value at each point in the image
Primal sketch	Makes explicit important information about the two-dimensional image, primarily the intensity changes there and their geometrical distribution and organization	Zero-crossings Blobs Terminations and discontinuities Edge segments Virtual lines Groups Curvilinear organization
2½-D sketch	Makes explicit the orientation and rough depth of the visible surfaces, and contours of discontinuities in these quantities in a viewer-centered coordinate frame	Local surface orientation (the "needles" primitives) Distance from viewer Discontinuities in depth Discontinuities in surface orientation
3-D model representation	Describes shapes and their spatial organization in an object-centered coordinate frame, using a modular hierarchical representation that includes volumetric primitives (i.e., primitives that represent the volume of space that a shape	3-D models arranged hierarchically, each one based on a spatial configuration of a few sticks or axes, to which volumetric or surface shape primitives are attached

FUNCTIONAL DECOMPOSITION

- As part of his top-down analysis, Marr also found a limited role for neuroscience and, more specifically, brain lesion studies. Lesion studies could be used to distinguish (non-serial) cognitive subsystems whose functional distinctness may not have been apparent to us otherwise.
  - Two visual systems: ventral and dorsal streams (what/where, cognition/action)
  - Memory: long-term vs. short-term (incl. working memory), episodic vs. semantic, declarative vs. procedural, etc.

Recall our question: “what is cognitive science?”

Marr’s multi-level explanatory framework hints at a potential answer: the interdisciplinary endeavour of uncovering, via top-down functional analysis, the fine-grained computational structure of the (human) mind.

The participating fields (psychology, linguistics, computer science, and neuroscience) are unified by a shared conceptual framework that allows a synoptic, multi-level account of the mind.

WHAT IS AT THE 'TOP' OF THE EXPLANATORY HIERARCHY?

So far, we've discussed various specialized "sub-personal" computational processes. But what about "personal level" thinking and reasoning, which we might associate with general intelligence?

- Common-sense or 'belief-desire' psychology

THE LANGUAGE OF THOUGHT HYPOTHESIS

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All thinking and reasoning takes place in a language.

The language in which thinking and reasoning occurs is not a public language like English or Japanese but an *internal* language: a *language of thought* (‘Mentalese’).

Indeed, public languages like English and Japanese presuppose LOT.

LOT is specifically computational.

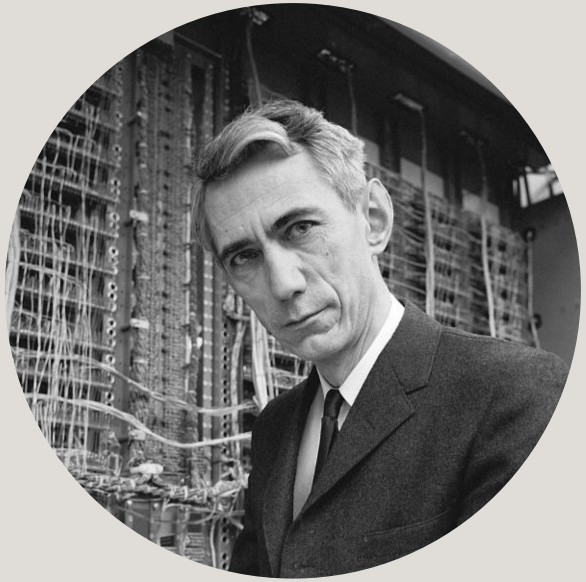
THE HISTORY OF THE REPRESENTATIONAL THEORY OF MIND ('RTM')

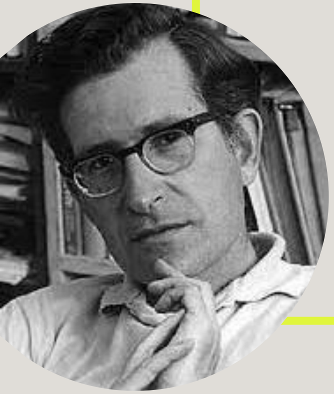
- The idea that the mind is a representational system is not new. British empiricists of the 18th century (e.g., John Locke) hoped to explain knowledge and reasoning by positing imagistic 'ideas' (copies of sense experiences).
- Acts of thinking and reasoning were taken to be causal sequences of associated such ideas.

THE NEW-FANGLED REPRESENTATIONAL THEORY OF MIND

The version of RTM that Fodor defends (and that he claims to find in cognitive science) is distinguished by the claim that the mind is a digital computer, i.e., a formal symbol manipulator.

Hence, he claims, the *computational theory of mind* ('CTM') is simply a new-fangled version of the old RTM.





LANGUAGE OF THOUGHT HYPOTHESIS

All thoughts possess two constituents:

- A propositional content
  - The thought expressed (e.g., that it is Thursday, that it is overcast, that Vancouver is in Canada, etc.)
- A propositional attitude
  - How the subject is thinking or cognitively related to the thought (e.g., believes, desires, hopes, fears, expects)

LANGUAGE OF THOUGHT HYPOTHESIS

According to LOT:

- The propositional content of a thought is the meaning of a LOT sentence.
- The propositional attitude is the subject’s ‘computational relation’ to the LOT sentence, which we can think of as the *causal* or *functional role* that the sentence is playing in the subject’s mental economy.

LANGUAGE OF THOUGHT HYPOTHESIS

The Language of Thought Hypothesis (LOT):

S thinks that P if and only if S is cognitively related to a sentence (in S's internal LOT) that means P.

Amogh believes that grass is green if and only if Amogh stands in the belief-relation to a LOT sentence that means grass is green.

LANGUAGE OF THOUGHT HYPOTHESIS

Jerry Fodor other LOT theorists will speak of LOT sentences being “in” the subject’s “belief box” or “desire box,” where the type of “box” a sentence is in a metaphor for how the sentence is disposed to causally interact with other LOT sentences and with behaviour.

Fodor takes a cognitive process to consist in a *causal succession* of sentence-tokens. In the case of reasoning, these internal state-transitions obey strict syntactic rules.

INTEGRATING COMMON-SENSE PSYCHOLOGY WITH COMPUTATIONAL PSYCHOLOGY

Fodor holds that we can translate (near enough) the theoretical taxonomy of common-sense psychology into the theoretical taxonomy of computer science. Familiar mental states (propositional attitudes of belief, desire, etc.) and processes (mental acts of reasoning, planning, decision-making, etc.) are, at bottom, computational states (computational-functional relations to token sentences) and processes (causal sequences of sentences).

We might see this as an attempt to theoretically ‘reduce’ personal level commonsense psychology to sub-personal computational psychology.

SOME OF THE MOTIVATIONS FOR LOT

MOTIVATION 1: AVOIDING 'MEANING HOLISM'

- Treats symbols as atomic units. Each word in Mentalese has a single semantic value that remains invariant across contexts. (There is no ambiguity in Mentalese).
- The meaning of a complex Mentalese sentence is a systematic function of the semantic values of the constituent elements and how those elements are put together or syntactically arranged. (Mentalese has the properties that linguists call 'constituency' and 'compositionality').
- The systematic recombinability of concepts allows uniformity of meaning.
- Contrast: a functionalist account that attempts to explain thought exclusively in terms of causal-functional roles.

MOTIVATION 2: EXPLAINING PRODUCTIVITY AND SYSTEMATICITY

The compositionality of Mentalese, in turn, seems to explain central features of human thinking:

(i) Productivity: human thinkers have the capacity to understand a large (seemingly infinite) number of expressions without having ever encountered them before.

(ii) Systematicity: if someone understands a complex expression (e.g., that Mary loves John), they will also understand different complex expressions that are obtained by recombining their constituents (e.g., that John loves Mary). (Cf. Evans' 'generality constraint' on concept possession).

MOTIVATION 3: EXPLAINING BOTH THE CAUSAL AND RATIONAL ROLES OF THOUGHT

Fodor emphasizes that LOT is the only available theory of mind that lets us view our thoughts as both *causing* and *justifying* our behaviour.

In virtue of their syntactic rules, the causal relations between LOT sentences *mirror* the rational (e.g., inferential) relations between the propositions that those sentences express.

MOTIVATION 3: EXPLAINING BOTH THE CAUSAL AND RATIONAL ROLES OF THOUGHT

Suppose someone is physically ‘wired’ in the following way. When any two sentences with the following syntactic properties are tokened in the subject’s belief box:

P1: $P \rightarrow Q$

P2: P

a third sentence of the following form is automatically tokened:

C: Q

Given this, we can predict what will happen next if the following two sentence-tokens were to occur in the subject’s belief box:

P1: If the sun is out this morning, I’ll walk to class.

P2: The sun is out this morning.

They will, in conformity with the logical schema outlined above, token the consequent of the conditional in P1, namely:

C: I’ll walk to class.

MOTIVATION 3: EXPLAINING BOTH THE CAUSAL AND RATIONAL ROLES OF THOUGHT

Fodor’s idea: even though C is caused by purely syntactic properties of P1 and P2 (by their “shape” or “form”), the subject is nevertheless *rationally justified* in inferring C. This is because the transition from P1 and P2 to C obeys a valid inference rule.

More generally, an individual’s thoughts will both cause and justify their actions when the syntactic relationships among their thoughts (i.e., the internal Mentalese sentences) are structurally isomorphic to the rational relationships among the propositional contents of their thoughts (i.e., the meanings of the Mentalese sentences).

Exploiting such parallelisms between syntactic and semantic structure (in the manner of a Turing machine), LOT shows how everyday personal level reasoning can be fundamentally a mechanical process.

PERIPHERAL VS. CENTRAL SYSTEMS

- Higher vs. lower cognitive processes
- Controlled vs. automatic

FODOR – MODULARITY OF MIND (1983)

For Fodor, the key difference between central and peripheral processes is modularity. Some core features of modular systems:

(i) informational encapsulation: a module's internal operations are restricted to the incoming input, together with any internally information stored *within* the module (a 'proprietary database')

(ii) speed

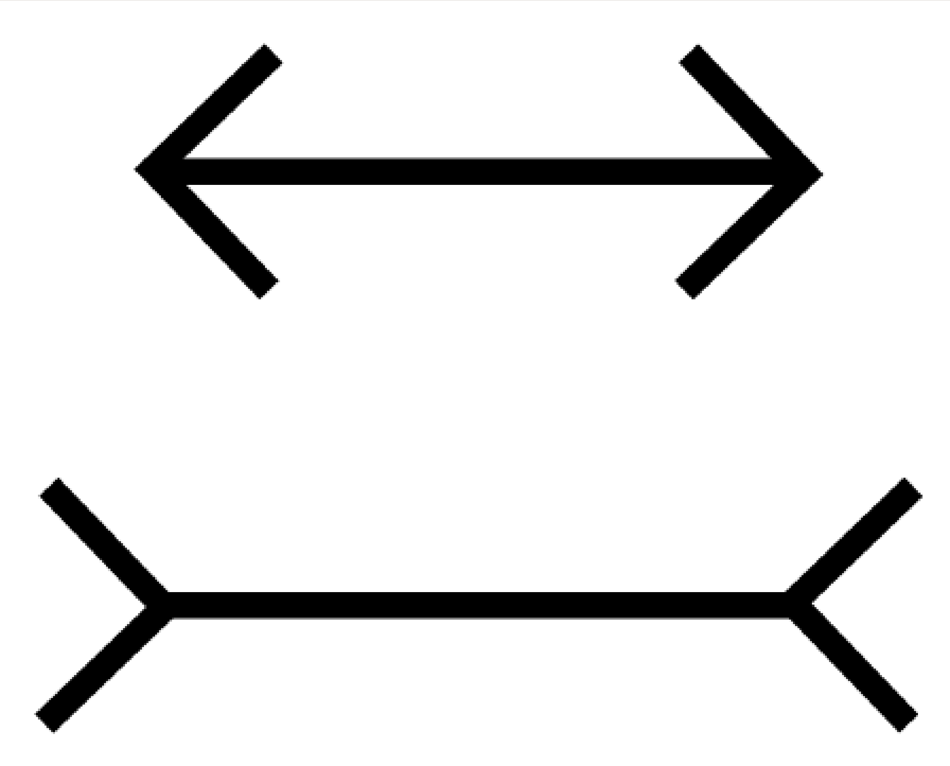
(iii) domain-specificity – the inputs to a module are restricted to a particular subject matter (e.g., edges, faces)

(iv) mandatory—once the inputs are received, the module's algorithms operate automatically and involuntarily (see Fodor 1983, pp. 47–99).

Apart from (i), Fodor was silent about whether these features are all essential, saying only that modules have "most or all" of them (p. 47).

MULLER-LYER ILLUSION

The two lines are actually the same in size (measure them!). And yet your knowledge of this fact does not seem to alter the way the lines visually appear.



CENTRAL SYSTEMS

Likewise, what constitutes a processor as being non-modular is (first and foremost) informational un-encapsulation (*a.k.a.*, cognitive penetrability), though Fodor seems that central processes are also slow, domain-general, and under intentional control.

Notably, Fodor seems also to have assumed that the non-modular processes of central cognition to be sequential. (Here, he was likely influenced by the traditional concept of a computer CPU).

CENTRAL SYSTEMS

Fodor singles out ‘abduction’ (i.e., inference to the best explanation) as an example of a central, non-modular process.

In abductive reasoning, we are essentially sensitive to ‘global’ properties of our total belief system – e.g., whenever we assess *simplicity* of an empirical hypothesis compared with other hypotheses, or how well it *coheres* or *makes sense* in light of everything else we take to be true. We are guided, throughout, by considerations of relevance.

Cf. Davidson’s claims about the rational norms governing common-sense psychology.