What are modules and what is their role in development?

s.butterfill@warwick.ac.uk

§1

Fodor's three claims about modules:

1. they are 'the psychological systems whose operations present the world to thought';

2. they 'constitute a natural kind'; and

3. there is 'a cluster of properties that they have in common' (Fodor 1983: 101).

These properties include:

- domain specificity (modules deal with 'eccentric' bodies of knowledge)
- limited accessibility (knowledge in modules is not usually inferentially integrated with general knowledge).
- information encapsulation (modules are unaffected by general knowledge or knowledge in other modules, i.e. 'top down' processing is limited)
- innateness (the information and operations of a module are genetically specified).

Modules play a role in explaining cognitive organisation, development and impairment.

E.g.: 'The infant's processing of the physical world appears to organise rapidly around a core structure representing the arrangement of … objects embedded in a system of mechanical relations' (Leslie 1994: 124).

§2

The 'Computational Theory of the Mind':

'*Thinking is computation*' (1998: 9).

Fodor's (?) argument against this theory:

1. Computational processes are not sensitive to context-dependent relations among representations.

2. Thinking sometimes involves being sensitive to context-dependent relations among representations as such (e.g. the relation … *is adequate evidence for me to accept that* …).

3. Therefore, not all thinking is computation.

'the Computational Theory is probably true at most of only the mind's modular parts. … a cognitive science that provides some insight into the part of the mind that isn't modular may well have to be different, root and branch' (Fodor 2000: 99).

§3

How do modules facilitate development?

Do they provide 'a basic infrastructure for knowledge and its acquisition' (Wellman and Gelman 1998: 524)?

'The module … automatically provides a *conceptual identification* of its input for central thought … in *exactly the right format* for inferential processes' (Leslie 1988: 193–4, my italics).

'The building blocks of all our complex representations are the representations

that are constructed from individual core knowledge systems.' (Spelke 2003: 307)

'core systems are conceptual and provide a foundation for the growth of knowledge' (Carey and Spelke 1996: 520)

'Once they have learnt these terms ['left' and 'blue'], the combinatorial machinery of natural language allows children to formulate and understand expressions such as *left of the blue wall* with no further learning' (Spelke 2003: 296).

Two notions of what this concept is:

The concept OBJECT is …

(a) that in virtue of having which we are able to think about objects as such;

(b) that in virtue of having which we are able to compute information about objects as such.

§4

Four months: infants enjoy categorical perception of phonemes (Eimas, Siqueland*, et al.* 1971), which arguably involves a speech module (Liberman and Mattingly 1985).

Three/four years: children first able to think and reason about phonemes as measured by standard tests for phonological awareness.

Standard tests of phonological awareness:

- sorting according to initial phoneme
- phoneme segmentation, blending
- word completion
- …

Success on these tests is best explained by a single factor and: (i) depends on language spoken, (ii) depends on literacy and writing system, (iii) varies from phoneme to phoneme.

'it does not follow from the fact that a child can easily distinguish *bud* from *bat* that he can therefore respond analytically to the phonemic structure that underlies the distinction' (I. Y. Liberman, Shankweiler, et al. 1974: 203).

References

Cheng, Ken (1986), 'A Purely Geometric Module in the Rat's Spatial Representation'. Cognition, 23, pp. 149-178.

Coltheart, Max (1999), 'Modularity and Cognition'. Trends in Cognitive Sciences, 3(3), pp. 115-120.

Eimas, P. D., et. al. 1971: Speech Perception in Infants. Science, 171(3968), pp. 303-306.

Fodor, Jerry (1983), *The Modularity of Mind: an Essay on Faculty Psychology.* Cambridge, Mass; London: MIT.

--- (2000), *The mind doesn't work that way: the scope and limits of computational psychology.* MIT Press.

Hermer, Linda and Elizabeth Spelke (1996), 'Modularity and Development: The Case of Spatial Reorientation'. Cognition, 61, pp. 195-232

Leslie, Alan (1988), 'The Necessity of Illusion: Perception and Thought in Infancy', in L. Weiskrantz (ed.) *Thought Without Language*. Oxford: Clarendon.

--- (1994), 'ToMM, ToBY, and Agency: Core Architecture and Domain Specificity', in L. Hirschfeld and S. Gelman (eds.), *Mapping the Mind: domain specificity in cognition and culture*. CUP.

Liberman, Alvin M. and Ignatius G. Mattingly (1985), 'The Motor Theory of Speech Perception Revised', Cognition, 21(1), pp. 1-36.

Liberman, I. Y., D. Shankweiler, F. W. Fischer and B. Carter (1974) 'Explicit Syllable and Phoneme Segmentation in the Young Child', Journal of Experimental Child Psychology, 18, pp. 201-212.

Spelke, Elizabeth (2003), 'What Makes Humans Smart?' in D. Gentner and S. Goldin-Meadow (eds.), *Advances in the Investigation of Language and Thought*. Cambridge, MA: MIT Press.

Wellman, Henry and Susan Gelman (1998), 'Knowledge Acquisition in Foundational Domains', in D. Kuhn and R. S. Siegler (eds.), *Handbook of Child Psychology*. New York: Wiley.