

Autism, Modularity and Evolution -- Stenning, Keith

The mind is undoubtedly modular because it is a biological structure and biological structures are modular. On the other hand, the ways that modularity has been employed in arguments about cognitive organisation and evolution have lead to uses of modularity which are misleading at best. This talk will explore modularity, taking a programmatic approach, touching on a number of disciplines, with the problem of understanding autism as its focusing example.

Our own relevant recent work has been on understanding human defeasible reasoning, showing that certain default logics provide a biologically plausible framework for understanding how undergraduate subjects approach tasks which psychological experimenters expect to be interpreted in classical logic (Stenning & van Lambalgen 2004). Default logics analyse interpretation and reasoning as an interaction between current input in Working Memory and pre-existing knowledge in databases of conditionals in Long Term Memory. They thus explain how subjects 'frame' the reasoning context. (Stenning & van Lambalgen 2005, in press b). We have preliminary data that suggest that autistic subjects show distinctive framing patterns expressible in these logics.

These logics are also known as 'planning logics' and so provide a direct link to executive function theories of autism. It is possible to present analyses of some of the standard diagnostic tasks (false-belief, perseveration of prepotent response, etc.) in terms of default reasoning. This raises questions about how distinctive 'Theory of Mind' and 'Executive Function Deficit' theories of autism actually are---a very first attempt at working out what a Theory of Mind might be like yields a formulation in 'executive function' logic.

The origins of the Theory of Mind are as a 'module' proposed for comparative and evolutionary explanation. This is an unbiological notion of module---evolution does not proceed by the addition of new modules but rather by the tweaking of old ones (Stenning, K. & van Lambalgen, M. in press a, and b). The talk will end with a sketch of some of the ingredients of a more biological approach to the role of modularity in explanations of autism. The key is that the relevant genetic changes are probably changes in the control of the timing of existing modular developmental processes.

Stenning, K. & van Lambalgen, M. (2004) A little logic goes a long way: basing experiment on semantic theory in the cognitive science of conditional reasoning. *Cognitive Science*, 28:4, 481-529.

<http://www.hcrc.ed.ac.uk/~keith/WasonSelectionTask/cogsci.pdf>

Stenning, K. & van Lambalgen, M. (2005) Semantic interpretation as computation in nonmonotonic logic: the real meaning of the suppression task. *Cognitive Science*, 29(6), 919--960.

<http://www.hcrc.ed.ac.uk/~keith/InterpretationandReasoning/suppression.pdf>

Stenning, K. & van Lambalgen, M. (in press a) Explaining the domain generality of human cognition. In M. J. Roberts (ed.) *Integrating the Mind*. Psychology Press

<http://www.hcrc.ed.ac.uk/~keith/generaltyofcognition.pdf>

Stenning, K. & van Lambalgen, M. (in press b) *Human Reasoning and Cognitive Science*. MIT Press (Chapter 8).

<http://www.hcrc.ed.ac.uk/~keith/LogicandPsychologyCourse/draft.pdf>