

Only Phenomenal Expectations Connect Core Knowledge of Objects to Thought

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1. Aims

What is the nature of infants' earliest cognition of physical objects? And how do you get from these early forms of cognition to knowledge of simple facts about particular physical objects?

2. 4- and 5-month-olds can track briefly occluded objects

scenario	method	source
1 vs 2 objects	habituation	Spelke et al 1995
one unperceived object constrains another's movement	habituation	Baillargeon 1987
where did I hide it?	violation-of-expectations	Wilcox et al 1996
wide objects can't disappear behind a narrow occluder	violation-of-expectations	Wang et al 2004
when and where will it reappear?	anticipatory looking	Rosander et al 2004

For a process to *track* an occluded object is for it to nonaccidentally depend in some way on the occluded object's path.

3. A Hypothesis about Object Indexes

Four- and five-month-olds' abilities to track briefly occluded objects depend on a system of object indexes like that which underpins multiple object tracking or object-specific preview benefits (Leslie et al. 1998; Scholl & Leslie 1999; Carey & Xu 2001; Scholl 2007; Carey 2009).

An *object index* is 'a mental token that functions as a pointer to an object' (Leslie et al. 1998, p. 11).

The *object-specific preview benefit* is the reduction in time needed to identify that a letter (or other feature) matches a target presented earlier when the letter and target both appear on the same object rather than on different objects.

Object indexes ...

- guide ongoing action (e.g. visual tracking, reaching)
- influence how attention is allocated (Flombaum et al. 2008)
- can be assigned in ways incompatible with beliefs and knowledge (e.g. Mitroff et al. 2005; Mitroff & Alvarez 2007)
- have behavioural and neural markers, in adults and infants (Richardson & Kirkham 2004; Kaufman et al. 2005).
- are subject to signature limits (Carey 2009, pp. 83–87)

- sometimes survive occlusion (Flombaum & Scholl 2006)

A *signature limit of a system* is a pattern of behaviour the system exhibits which is both defective given what the system is for and peculiar to that system.

4. Question

How could the operations of object indexes explain purposive actions like looking longer at one thing than another?

First idea: the operations of object indexes give rise to corresponding beliefs. Objection: if four- and five-month-olds had such beliefs they should search for occluded objects, which they do not (e.g. Shinskey & Munakata 2001; Moore & Meltzoff 2008).

Second idea: phenomenal expectations ...

5. Phenomenal Expectations

... are aspects of the overall phenomenal character of experiences which their subjects take to be informative about things that are only distantly related (if at all) to the things that those experiences intentionally relate the subject to.

Phenomenal expectations can be thought of as sensations in approximately Reid's sense: they are monadic properties of events, specifically perceptual experiences, which are individuated

by their normal causes and which alter the overall phenomenal character of those experiences in ways not determined by the experiences' contents (so two perceptual experiences can have the same content but distinct sensational properties).

Phenomenal expectations are signs: they can lead to beliefs only via associations or further beliefs (Reid 1785a, Essay II, Chap. 16, p. 228; Reid 1785b, Chap. VI sect. III, pp. 164–5).

6. Development is Rediscovery

How do you get from core knowledge to knowledge proper?

The Assumption of Representational Connections: the transition involves operations on the contents of core knowledge states, which transform them into (components of) the contents of knowledge states.

Most proposals rely on this assumption, including: (i) Spelke's suggestion that mature understanding of objects derives from core knowledge by virtue of core knowledge representations being assembled (2000); (ii) claims by Leslie and others that modules provide conceptual identifications of their inputs (Leslie 1988); (iii) Karmiloff-Smith's representational re-description (1992); and (iv) Mandler's claim that 'the earliest conceptual functioning consists of a redescription of perceptual structure' (1992).

If object indexes influence actions only via phe-

nominal expectations, the Assumption of Representational Connections is wrong.

Alternative assumption: the transition depends only on the effects of core knowledge states on behaviour, attention, and sensation.

Development is rediscovery: the emergence of knowledge involves rediscovering information already encoded as core knowledge.

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