

Margolis, E., & Laurence, S. (2011). Beyond the Building Blocks Model. *Behavioral and Brain Sciences*, 34:3, pp. 139-140. DOI: 10.1017/S0140525X10002177

This is a preprint. Please visit Cambridge University Press for the official publication.

Beyond the building blocks model

Eric Margolis and Stephen Laurence

Abstract: Carey rightly rejects the building blocks model of concept acquisition on the grounds that new primitive concepts can be learned via the process of bootstrapping. But new primitives can be learned by other acquisition processes that do not involve bootstrapping, and bootstrapping itself is not a unitary process. Nonetheless, the processes associated with bootstrapping provide important insights into conceptual change.

Concept learning often involves the construction of complex concepts in accordance with a compositional semantics. It is widely assumed that the primitive concepts that form the basis of all complex concepts are themselves innate—a view we call the building blocks model of concept learning. The building blocks model is central to Fodor's (1981) case for radical concept nativism but also to moderate forms of nativism, such as Pinker's (2007), and is assumed by virtually all empiricist accounts of concept learning. A central theme in *The Origin of Concepts* (Carey 2009), however, is that the building blocks model is mistaken; new primitives can also be learned. One of the most important ways of learning a new primitive, according to Carey, is via conceptual bootstrapping.

We agree with Carey both about the limitations of the building blocks model and about the significance of bootstrapping. However, bootstrapping, as Carey herself acknowledges, is not the only way of learning new primitive concepts. Nor is bootstrapping itself a single unitary process. Rather, bootstrapping consists of a number of distinct processes that resemble one another to varying degrees.

Carey cites six criteria for bootstrapping to occur, but the two that seem especially important are (1) the reliance on initially uninterpreted (or minimally interpreted) external symbols, and (2) the reliance on modeling processes. The external symbols serve as a placeholder structure, while the modeling processes facilitate their interpretation. When all goes well, the representations that correspond to the placeholder structure take on suitable inferential roles determining the new concepts' narrow content. Although analogical reasoning is often involved, other modeling processes include the use of thought experiments, limiting-case analyses, and abduction.

Our doubts about the unity of bootstrapping have to do with the character of the placeholder structure and the variety of modeling processes. As Carey describes the role of placeholders, they are initially uninterpreted (or minimally interpreted) and it is the rich relations among these external symbols that do most of the work in constraining the interpretation that bootstrapping achieves. These aspects of bootstrapping are especially clear in her flagship example of the positive integers. In other instances, however, the placeholder itself is well-understood (even if

the concepts to be acquired are not) and there are few inter-symbol relations to speak of. Take Kepler's concept of motive force. According to Carey, the placeholder for Kepler's bootstrapping was the abductive hypothesis that something in the sun causes the motion of the planets, and the bootstrapping process led him to the idea of a force emanating from the sun that causes the motion of the planets. Although Kepler fully understood the placeholder hypothesis, the analogy he eventually hit upon did not depend upon the structure of the placeholder – unlike the number case, where the structural mapping between the ordered list of uninterpreted number words and ordered sets is crucial.

Regarding the various modeling processes that bootstrapping relies upon, the question is how alike they are once you get into the details. Analogy perhaps is to be accounted for in terms of structure mapping (Gentner 1983). But it is doubtful that structure mapping is essential to working through a thought experiment or engaging in abductive inference, and different instances of bootstrapping will appeal to different types of modeling processes. If these processes have anything in common, it would seem to be a loose affinity in how they contrast with empiricist learning strategies, such as association and statistical analysis.

Like bootstrapping, our own (Laurence & Margolis 2002) model of concept acquisition provides an account of primitive concept acquisition. On our model, new natural kind concepts are created by a dedicated acquisition system that employs a conceptual template. For example, on exposure to a new type of animal, the system creates a new mental representation with slots for information about the animal's salient perceptual properties (a "syndrome"), while ensuring that the representation's role in inference is governed by an essentialist disposition. Together, the syndrome and the essentialist disposition establish the appropriate mind-world dependency relations to underwrite conceptual content. This account differs from Carey's in a number of important respects. One is that our account involves a dedicated system for acquiring new primitive concepts of a particular type. Also, our account does not require the use of external symbols but instead has the acquisition system directly deploy new mental representations; on our model, even an isolated individual who has no external symbol system could acquire a new animal concept. Finally, our account does not implicate modeling processes.

New primitives are not limited to those acquired via dedicated acquisition systems, however. Consider, for example, concepts for new rituals. One might acquire such concepts by deploying new representations that then serve as accretion points for conceptual roles. This might be facilitated by an external symbol system (e.g., words for aspects of the ritual), but a placeholder structure is not necessary. And since acquiring concepts on an accretion point model of this sort might be as easy as the gathering of factual information, the steps involved need not involve modeling processes or result in incommensurability. This model is inspired by Block's (1986) discussion of conceptual role semantics. But it is in fact compatible with a variety of theories of content that treat the new concepts as primitive. What allows the concepts to be primitive is the fact that the conceptual roles can be non-analytic and defeasible. As a result, there are at least two alternatives to bootstrapping – our earlier model and this accretion point model. Both of these alternatives to bootstrapping, however, are ill-suited for learning the more demanding concepts that Carey's bootstrapping account can accommodate – the kind that rely on formal education for children and intellectual breakthroughs for scientists. For this reason, bootstrapping processes are crucial.

Contrary to the building blocks model, human beings have a number of ways of fundamentally expanding their conceptual system. Though bootstrapping itself is not a single process, the sorts of cognitive operations that Carey draws attention to help us to understand some of the most challenging instances of conceptual change, particularly those that involve incommensurability.

ACKNOWLEDGMENT

Eric Margolis thanks Canada's Social Sciences and Humanities Research Council for supporting this research.

NOTE

This article was fully collaborative; the order of the authors' names is arbitrary.