Flux: Fundamental or Frivolous?

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Symposium summary

A broad range of findings across the cognitive sciences has emerged revealing surprising flexibility and dynamic flux in a large range of cognitive domains. These include exciting new discoveries of neuroplasticity well into adulthood, discoveries of great cognitive variability as a function of the statistical properties of one's environment (from patterns in natural languages, to those in embodied experience), and discoveries of the surprisingly dynamic microstructure of cognition. Do such findings demonstrate that many fundamental aspects of cognition are indeed quite flexible? Or does finding that some aspect of cognition is flexible mean that it is therefore not fundamental? Or is flux the only truly fundamental thing about cognition in the first place? The talks in this symposium will speak to these questions from a variety of perspectives (incorporating ideas from development, neuroscience, computational insights, and cross-cultural approaches), and help us clarify our thinking about what such findings mean.

Variability and Specificity in Human Neuroplasticity: Flux is Fundamental!

Helen Neville and Christina Karns
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The brain is in a state of constant change. In fact, one might argue that the reason some systems have such short critical periods is the constant pressure from competing systems in a rapidly changing brain. Different brain systems and related functions display markedly different degrees or 'profiles' of neuroplasticity in human development. Some systems are strongly determined and are not altered even when experience has been very different. Others are highly modifiable by experience and dependent on experience but only during particular time periods. There are several different such sensitive periods, even within a domain of processing. A third 'plasticity profile' is demonstrated by those neural systems that remain capable of change by experience throughout life. Neuroplasticity is a double-edged sword that permits both enhanceability and vulnerability. These findings contribute to a basic understanding of the nature, mechanisms and constraints of human brain plasticity, a fundamental player in all aspect of cognition. In addition, they can contribute information of practical significance in the design and implementation of educational programs.

Flexibility does not imply flux

Arthur B. Markman
University of Texas

Cognitive Science often focuses on the core aspects of cognitive processing that are common across individuals. Indeed, we often treat adaptability to context and variability across individuals as statistical error. Periodically, however, this variability comes into focus. This focus on variability is typically accompanied by calls for a fundamentally different way of characterizing cognitive processing such as dynamical systems, situated cognition, or embodied cognition. That is, there is an implicit assumption that the fluidity of cognitive processing is somehow incompatible with many of the core explanatory constructs in the field. I argue that variability and flexibility in cognitive processing is crucial for us to understand, but that they are explicable without having to give up most of the traditional representational and processing assumptions of cognitive science. I illustrate this point with examples from analogical reasoning, decision making, and motivation.

Surfing the Standing Wave of Cognition

Michael J. Spivey
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Many of the most noticeable properties of cognition appear to be stable structures, concepts and categories in the mind that seem to function like static representations of things out in the world. This appearance of stability stands out in sharp relief at the time scale of several seconds, during momentary introspection or in a paper-and-pencil experiment. At finer and coarser time scales, there are dramatic patterns of change in those same cognitive structures, during neural processing and real-time responses and during long-term task performance and learning. This endemic property of flux that both underlies and overlays our subjectively stable mental entities has become the poster child for a theoretical framework in cognitive science calling itself the dynamical systems account of cognition (e.g., Chemero, 2009; Elman et al., 1996; Kelso, 1996; Port & Van Gelder, 1996; Spivey, 2007; Thelen & Smith, 1994; Ward, 2002). In this framework, the mental entities that appear as stable structures in cognition are much like standing waves which, if not examined at multiple time scales, cannot be properly understood. Essentially, even those things that appear stable in cognition are actually seen to be in flux when carefully analyzed. Therefore, if being in flux somehow prevents a property from being fundamental, then nothing in cognition is fundamental.

Solid as a rock, smart as a rock?

Lera Boroditsky
Stanford University

The human ability to flexibly adapt to a wide and unpredictable range of circumstances is the very trademark of human intelligence. When we study flexibility and diversity in human thought, we are approaching what may in fact be the human essence, those qualities that distinguish us from all other creatures. In this talk I will highlight a number of discoveries of radical diversity in human cognition, as a function of cultural and linguistic context. I will highlight four categories of differences that constitute different aspects of being "fundamental": differences that are deep, differences that are pervasive, differences that are big, and differences that are important. These findings demonstrate that many aspects of cognition that were previously thought to be static or pre-determined, are indeed quite flexible, the product of cultural invention and transmission. Studies of cross-cultural variation demonstrate that people can construct a variety of radically different perspectives on the same physical reality. I will argue that it is this flexibility that allows us to construct ever more complex and sophisticated conceptual tools, and adapt so successfully in cultural as opposed to in evolutionary time. When it comes to higher-level cognition, being solid as a rock may only be desirable if one wants to be as smart as one.