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Exploring Mind and World:
A Symposium in Honor of Roger N. Shepard

In a career spanning more than fifty years, Roger Shepard has influenced and inspired several generations of cognitive scientists – or we should say, *every* generation of cognitive scientists. Over that time, he has introduced more than one revolution in how we study and understand the mind. This symposium features four talks from researchers who have been inspired by Shepard's most recent turn, the quest to understand the relation between mind and world, and the prospects for elucidating universal laws in either domain. The critical questions include: How does the internal structure of the mind come to reflect the structure of the external world? To the extent that mental structure has effectively internalized world structure, can we learn deep truths about one through a proper study of the other? That is, could we possibly derive universal laws of mind from enduring properties of the external world, or infer physical laws merely by looking into how our own minds represent the physical world?

Universal laws of the mind?

Nick Chater
University College London

Cognitive science appears to have uncovered relatively few universal laws. This talk considers some proposed laws, including Shepard's Universal Law of Generalization. What are the prospects for laws in cognitive science? Should we expect these laws to be exceptionless? How far might universal laws help to integrate the ever fractionating experimental and theoretical territory of cognitive science?

Simple minds in a complex world

Jacob Feldman
Rutgers University

A central theme in Shepard's work is that mental representations are informed by an isomorphism between the head and the world. A key step towards fulfilling this program would be a better understanding of the nature of this isomorphism. For example, one might imagine that the bias towards simplicity in inductive generalization reflects an expectation that processes in the world tend to be simple and regular. But the world is a complex place, and such an expectation can only be useful to the extent that is roughly correct—that the world is indeed governed by regular processes at about the level of complexity we expect. So a key question in understanding human induction is: what degree of complexity in our hypotheses is most appropriate for modeling the regularities in the world? Theories of human learning are full of unstated (and thus unsupported) assumptions about what the answer to this question is. I will argue that we have no idea what the answer is, and that we can't fully understand human induction until we do.

Inductive learning of inductive constraints

Joshua B. Tenenbaum & Charles Kemp
Massachusetts Institute of Technology

Shepard's work on generalization draws attention to a fundamental feature of human cognition: the ability to make accurate inductive inferences from very limited data – often just one or a few examples. This ability suggests the need for strong prior knowledge, or a constrained hypothesis space of candidate generalizations, and it is natural to suppose that these constraints are innate. Shepard's theory casts generalization as a Bayesian inference process, in which hypotheses for generalization correspond to convex regions in a low-dimensional psychological space that has been shaped through the process of evolution. Yet the notion of strong innate constraints seems at odds with another fundamental aspect of human cognition: its great flexibility. People can learn entirely new systems of concepts that have little or no precedent in evolutionary history and little or no grounding in direct perceptual experience. We present a framework for modeling inductive learning in which, following Shepard, mental representations of a domain's structure strongly constrain generalization, but these domain representations may themselves be learned and may take on different forms for different domains. This approach could help to explain how humans have evolved to learn so quickly from such little data, across so many different domains of experience.

On Thought Experiments

Tamar Szabo Gendler
Yale University

Shepard has proposed that thought experiments in physics are effective to the extent that "our mind's eye has come to internalize implicit physical and mathematical knowledge." While accepting the basic insight, I will consider this hypothesis critically. Drawing on recent philosophical discussions of scientific methodology and examples from the history of physics, I will suggest that it overgenerates in some cases, and undergenerates in others.