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Book Reviews

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THE ANALOGICAL MIND: PERSPECTIVES FROM COGNITIVE SCIENCE

Edited by Dedre Gentner, Keith J. Holyoak and Boicho N. Kokinov
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'…Gilgamesh covered

Enkidu's face with a veil like the veil of a bride.

He hovered like an eagle over the body,

or as a lioness does over her brood'.

(Gilgamesh, 2000 BC, cited in Holyoak, Gentner & Kokinov, chapter 1, p. 4).

A 13-month-old infant, not yet capable of speech, watches an adult retrieve an out of reach doll by removing a barrier and pulling a string attached to the toy's foot. Following this demonstration, the child is able to retrieve another out-of-reach toy for herself.

(Chen, Campbell & Polley, 1995, cited in Goswami, chapter 13)

What does the description of the Mesopotamian hero-king have in common with the infant's actions? Each involve analogical reasoning; the ability to think about relational patterns. The comparison between Gilgamesh and the lioness is not a literal one; we are not asked to believe the King's appearance resembles that of a lioness. Instead we are asked to draw a structural comparison; it is his vigilance over his friends' corpse that we are asked to compare to a lioness' watch over her cubs. The modern day infant performs a similar feat of reasoning. In solving the novel problem for herself she must ignore superficial differences between the model's actions and her own. She must concentrate instead on the structural similarities between the two problems; the causal relations which can be transferred from one problem to another (Goswami, chapter 13).

This edited volume describes the 'state of the art' in analogy research. The editors, Gentner, Holyoak and Kokinov, have been at the forefront of analogy research for over twenty years. In this volume they combine their expertise with that of researchers from diverse disciplines; exploring the role of analogy in decision making (chapter 11), emotional inferences (chapter 10), metaphor (chapter 6), education (chapter 12) and politics (chapter 9).

The two examples quoted above, the ancient poem and the infant's actions, hint at the significance of analogical reasoning for general cognition. Analogical reasoning appears in our earliest preserved literature (Holyoak, Gentner & Kokinov, chapter 1) and we demonstrate the skill, in a rudimentary form, from early childhood (Goswami, chapter 13). The centrality of analogy to cognition is a theme developed throughout this volume. Analogy, is, according to Hoftsadter (chapter 15), 'the lifeblood…of human thinking'. It is the means through which we form basic categories such as 'same' and 'different' as well as more sophisticated ones like 'helicopter' and 'ethnic cleansing'.

Despite the immense significance of analogy for human cognition, a third example from the book

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suggests that analogy is not a uniquely human skill. Oden, Thompson and Premark (chapter 14) present evidence that Sarah, a chimpanzee *Pan troglodytes*, is able to perform simple analogies with geometric shapes. In the most impressive demonstration of this ability, Sarah is presented with a marker board. In the centre of this board is a symbol which she has been trained to recognise as meaning 'the same as'. She is also given some pictures of geometric shapes. Her task is to construct a shape-based analogy. For example, two circles can be considered analogous to two triangles because they shared the relation of 'sameness'. Sarah is able to construct analogies such as this above chance level.

How is such a feat achieved? How does a chimpanzee recognise the equivalence between sets of shapes? How did a Mesopotamian poet, writing 4000 years ago, come to equate the mourning of a king with the attentiveness of an eagle? How does a pre-linguistic infant recognise the structural similarity underlying two physical problems? An entire section of this volume is devoted to computational models of analogy. The approaches adopted vary from agent-based, to connectionist and hybrid models. However, the models are connected by a desire to locate analogical reasoning within the general context of human cognition. Forbus (chapter 2) applies models of analogy to our ability to reason about physics problems. Kokinov and Petrov's model integrates reasoning by analogy with memory (chapter 3).

By situating analogy within general cognition, the volume is able to move between abstract and applied domains. Bassok (chapter 12), for example, discusses the role of analogy in teaching and learning mathematical word problems.

In their desire to locate analogy at the heart of cognition, some of the authors in this volume define analogy very broadly. In the epilogue, analogy appears to collapse into categorisation. Analogy is, according to Hofstader, 'everything…or almost'. Even if this conclusion goes too far for some readers, the book is an impressive overview of the importance of analogy in cognition.

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The reviewers have research interests in cognition and development. They study the cognitive mechanisms underlying imitation.