Structure-Mapping: Twenty Years After

It is twenty years since the publication of Gentner's (1983) paper on structure-mapping theory. This theory was one influence in creating the subfield of analogical learning and reasoning within Cognitive Science. Over the ensuing two decades, analogy has become a central focus in Cognitive Science, both in psychological research and in computational modeling. Great strides have been made in delineating the basic processes of analogy and similarity and their roles in learning and reasoning.

This symposium presents a range of work both testing basic predictions of Structure-Mapping Theory and applying it to cognition in the large. We present research showing that the principles of structural alignment and mapping theory apply broadly throughout cognition — to categorization, decision-making, and learning and transfer.

- Phillip Wolff will present research testing the structure-mapping predictions concerning the time-course of metaphor comprehension. The results of two series of studies, one using a metaphor interference technique and one using a deadline procedure, indicate that metaphor processing shifts from an initial role-neutral alignment to a later role-sensitive directional process, as predicted.

- Ken Forbus will survey the psychological predictions and results arising from the Structure-Mapping Engine (SME). He will describe some new large-scale simulation efforts, including the use of analogies in sketching, and discuss a new problem in analogical reasoning, *skolem resolution*.

- Arthur Markman will discuss the role of structural comparison in decision making. Research on choice and consumer behavior demonstrates the importance of analogy to the way people represent and evaluate choice options. Early in learning about a domain, people structure their knowledge by drawing analogies between new items and known items. In domains for which people already have some expertise, processes of structural alignment among options determines which information -- i.e., commonalities and alignable differences -- is most likely to be used to evaluate the options.

- Kenneth Kurtz will present research on the role of comparison in learning to detect anomalous features of complex perceptual stimuli. Across several studies, presenting a target jointly with an easily aligned standard yields more accurate and efficient detection than either presentation of a target alone or pairing with a low-alignable (but equally informative) standard. Further studies show a comparison benefit in perceptual learning. People perform better on solo trials after comparison experience than after an equal exposure to separate items.

- Dedre Gentner will discuss the role of comparison in learning concepts and rules. Building on prior evidence that comparing exemplars improves transfer to new situations, these studies demonstrate that comparison heightens attention to common relations in both in adults and children. Further, this relational heightening occurs even when the pairs share common objects as well as common relations.

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