Salient Sentence Summary: "High-level Perception, Representation, and Analogy"

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1. One of the deepest problems in cognitive science is that of understanding how people make sense of the vast amount of raw data constantly bombarding them from their environment. The essence of human perception lies in the ability of the mind to hew order from this chaos, whether this means simply detecting movement in the visual field, recognizing sadness in a tone of voice, perceiving a threat on a chess board, or coming to understand the Iran-Contra affair in terms of Watergate.

2. Low-level perception is far from uninteresting, but it is high-level perception that is most relevant to the central problems of cognition. The study of high-level perception leads us directly to the problem of mental representation. Representations are the fruits of perception.

3. One of the most important properties of high-level perception is that it is extremely flexible. A given set of input data may be perceived in a number of different ways, depending on the context and the state of the perceiver. Due to this flexibility, it is a mistake to regard perception as a process that associates a fixed representation with a particular situation.

4. The distinguishing mark of high-level perception is that it is semantic: it involves drawing meaning out of situations. The more semantic the processing involved, the greater the role played by concepts in this processing, and thus the greater the scope for top-down influences. The most abstract of all types of perception, the understanding of complete situations, is also the most flexible.

5. So many varieties of data were available to Kepler, and the available data had so many different ways of being interpreted, that it is difficult not to conclude that in presenting their program with data in such a neat form, the authors of BACON are inadvertently guiltyof20-20 hindsight. BACON, in short, works only in a world of hand-picked, pre-structured data, a world completely devoid of the problems faced by Kepler or Galileo or Ohm when they made their original discoveries.

6. The dominant approach(in analogies for machines) involves starting with fixed, preordained representations, and launching a mapping process to find appropriate correspondences between representations. The mapping process not only takes center stage; it is the only actor. Perceptual processes are simply ignored; the problem of representation-building is not even an issue

7. Thus, when one is designing a representation for SME, a large number of somewhat arbitrary choices have to be made. The performance of the program is highly sensitive to each of these choices. In each of the published examples of analogies made by SME, these representations were designed in just the right way for the analogy to be made. It is difficult to avoid the

conclusion that at least to a certain extent, the representations given to SME were constructed with those specific analogies in mind.

8. The fact that most current work on analogical thought has ignored the problem of representation-formation is not necessarily a damning charge: researchers in the field might well defend themselves by saying that this process is far too difficult to study at the moment. In the meantime, they might argue, it is reasonable to assume that the work of high-level perception could be done by a separate "representation module", which takes raw situations and converts them into structured representations.

9. For any model of high-level perception to get off the ground, it must be firmly founded on a base of low-level perception. But the sheer amount of information available in the real world makes the problem of low-level perception an exceedingly complex one, and success in this area has understandably been quite limited. Low-level perception poses so many problems that for now, the modeling of full-fledged high-level perception of the real world is a distant goal.

10. This does not mean, however, that one must admit defeat. There is another route to the goal. The real world maybe too complex, but if one restricts the domain, some understanding maybe within our grasp. If, instead of using the real world, one carefully creates a simpler, artificial world in which to study high-level perception, the problems become more tractable.