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TRACKING TRENDS & PERFORMANCE IN BASIC RESEARCH



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2008 : October 2008 : Merav Ahissar & Shaul Hochstein

EMERGING RESEARCH FRONTS - 2008

October 2008



Merav Ahissar & Shaul Hochstein talk with *ScienceWatch.com* and answer a few questions about this month's Emerging Research Front Paper in the field of Psychiatry/Psychology.



Article: View from the top: Hierarchies and reverse hierarchies in the visual system

Authors: Hochstein, S;Ahissar, M

Journal: NEURON, 36 (5): 791-804 DEC 5 2002

Addresses: Hebrew Univ Jerusalem, Dept Neurobiol, IL-91904 Jerusalem, Israel.

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(addresses have been truncated.)

SW: Why do you think your paper is highly cited?

It introduces a coherent conceptual framework to behavioral, electrophysiological, and imaging data of perception and perceptual learning. In addition, it tackles the exciting issue of what brain activity enters consciousness.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

It is a new conceptual framework, which we named Reverse Hierarchy Theory or RHT, for short.

SW: Would you summarize the significance of your paper in layman's terms?

Its main novelty is in its well defined dissociation between stimulus processing and perceptual experiences. According to RHT, while stimulus processing is a sequence of hierarchical processes, driven in bottom-up fashion from the sense organs (eye, ear) via a number of brain regions to higher cortical levels, perception follows a reverse order. Conscious perception reflects the cortical interpretation of these initial implicit processes, which follows a reverse hierarchy, top-down driven order.

This simple dissociation explains a broad set of seemingly inconsistent data. For example—what do we see first—the whole or the details? On the one hand, details are processed first. On the other hand, we are quicker at getting the gist of scenes than we are at perceiving their components; we are quicker at perceiving whole words than the letters that comprise them, we know the average size or direction of motion of a group of objects rather than the sizes or motions that compose the average.



Coauthor
Shaul Hochstein

RHT asserts that only the gist is represented at high levels of the cortical hierarchy—which is where conscious perception begins—whereas perceiving the components requires re-entry to lower-processing stages. This re-entry is essential for gaining conscious access to details and components. However, attaining it successfully requires a search backwards along the hierarchy. This backward search takes time and specific conditions.

SW: How did you become involved in this research and were any particular problems encountered along the way?

For over 10 years, we had been studying perception and perceptual learning of simple visual tasks among university students and saw huge variability that could not be explained by any existing conceptual framework.

SW: Where do you see your research leading in the future?

"...it tackles the exciting issue of what brain activity enters consciousness."

We are focusing on other senses and additional aspects of cognitive skills. We believe that this framework may explain cognitive impairments in specific populations. Furthermore, we believe that this basic distinction applies in many domains, even beyond brain research.

SW: Do you foresee any social or political implications for your research?

We hope it will impact on concepts in education. For example, when teaching math and sciences—what would be the most effective interplay between building bottom-up processing procedures by using many exercises and guiding top-down "insights" by guided conceptual explanation?

We believe that the same dissociation can also explain organizational and general sociological processes. That is, the distinction between the bottom-up processes that occur whenever people act in a group, versus people's attempt to act upon them based on conscious top-down interpretations.

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Keywords: reverse hierarchy theory, coherent conceptual framework, behavioral, electrophysiological, imaging data, perception, perceptual learning, perceptual experiences, cognitive impairments in specific populations.



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