The Biological Constraint

A Symposium

Organizer: James L. McClelland
Department of Psychology
Carnegie-Mellon University

Many biologists see human cognition as a supreme example of the power of biological mechanisms. But cognitive scientists often forget that cognition is a biological process at all.

In the early days of cognitive science and its predecessors, a shift away from biology was important and justified. Our first task was to show that ideas, memories, thoughts and perceptions were important explanatory constructs, independent of their possible implementation in the brain. Now, it occurs to more and more of us that what we know about the brain and its evolution might help us to understand cognition more deeply. To some, the standard tools of the cognitive psychologist seem insufficient to answer fundamental questions. To others, the struggle to implement intelligence in the von Neumann computer has yielded increased respect for the computational power of the brain. These and other feelings have motivated a search for clues to cognitive function in the biological substrate.

As we have been moving in these directions, there has been considerable development around us. A number of researchers trained in neurophysiology have begun to suggest how what we know about the brain can be used to enhance our models of cognitive processes. Neuropsychologists have been employing the methodological and theoretical tools of the cognitive scientist in their analyses of neurological dysfunction, with results which are sure to influence theorizing about normal cognition. And some psychobiologists have suggested how an evolutionary perspective might help us understand some aspects of mental organization.

This symposium is intended to celebrate and reinforce these trends. Four speakers, each representing a different viewpoint on the biological constraint on cognition, will give us brief glimpses of their work. Neal Cohen describes some striking evidence of preserved ability to acquire cognitive skills in patients who show profound deficits in the ability to remember facts and events. This evidence has profound implications for theories of learning and memory. Paul Rozin explains how an evolutionary approach can shed light on the roles of specialized modules and generalizable systems in cognition. Terry Sejnowski describes some of the properties of the cerebral cortex and points to some of the implications of these properties for biological computation. And Jerry Feldman tells us some of the ways we must change our thinking about cognitive processes if we wish to develop models that respect the strengths and weaknesses of the brain.