

Intentionality in Cognitive Perceptual Systems

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## Introduction

A century of success by the scientific community in unifying the physical and life sciences has led to widespread support of the reductionist belief that all domains of science are systematically related to and explained by the scientific laws of another domain. Paralleled by increased rigidity in the psychological study of behavior, the steady increase of cohesive explanations of biological phenomenon as diverse as the formation of lipid bilayers, the development of the digestive tract, the rhythms of the heart, and the inheritance of physical traits naturally led to optimism that someday the behavioral repertoires of the earth's creatures could also be explained by biology.

The questions that came under scrutiny by biologists are not new ones: as is characteristic of the interplay between philosophy and science, there already exists a long tradition of thought regarding the possibility of explaining behavior within the framework of the physical and life sciences. Yet the methods of exploration and theoretical structure used by biology to delve into the relationship between the nervous system and behavior are of such a different nature than those used by philosophy to explore relationships between mental structure and behavior that the two remain quite inaccessible to each other. While some feel that this academic schism represents a real and unbridgeable gap in the ability of the physical sciences to explain mental phenomenon (see Levine 1983 & 1993), many researchers operate under the assumption that it is only a matter of time before the scientific study of mind uncovers the biological basis of learning, memory, and consciousness. This second opinion stems from the general belief that there are no *a priori* reasons why thought processes are not reduceable within materialistic theories of cognition, and whether or not they do is purely an empirical matter. The materialistic, empirical study of mind aims to find reductive explanations that make mental representations "demystified, unified, [and] placed on more secure foundations" (Dennett, 1995, 89) and do so in a manner that is informative of *why* a particular physical state counts as a mental state.

As a field situated somewhere between the strictly biological approach of neuroscience and the largely introspective theorizing of philosophy, the study of intelligent systems (cognitive science) deals with the question of whether or not bottom-up, physical approaches to studying brain matter and top-down, theoretical approaches to studying mental structure can be reconciled. What is sought is a unified theory of mental architecture that accounts for philosophical structure and psychological phenomenon while remaining biologically plausible. Towards that goal, I aim to outline some reactions to the philosophical treatment of mind that are inspired and supported by perception research in cognitive science and psychology. Unlike a fair body of previous philosophical work concerning mental architecture, I treat biological implementation not as something to be abstracted away from in an information theory, but as the most salient example of the type of computational organization required to produce the types of behavior of interest. However, I will orient my discussion of mental architecture in the philosophical questions that arise when trying to construct a materialistic theory of mind independent of biological and computational concerns, both to emphasize the importance of these questions and to make clear the reasons for the academic separation that exists. After defining the relevant philosophical points, I will turn to specific computational and biological architectures

to evaluate their success in dealing with these philosophical constraints.

Historically, philosophical questions of meaning in physical systems (the human brain being the system of primary interest) have centered around the concepts of representation and intentionality, or "aboutness." Since Descartes, the ever present question of whether mental activity is somehow different or separate from the observable world has cast doubt on mans' ability to accurately perceive the world. The nature of this difference has taken various forms, from theories that posit two types of fundamental *stuff* to theories that place the difference in the nature of meaning, and/or representation, and/or physical structure. Yet the positing of a difference between the world and mental activity requires some type of link *between* the world and mental activity. This concern arose from a general sense that human psychological states have referents in reality, i.e., a belief does not stand alone but is a belief about something. How is it that any kind of mental representation of the perceived world can maintain reference to the perceived objects if these two things are somehow fundamentally different?

My discussion of mental architecture will take place in three parts. First, I will address the nature of *representation* in general by fleshing out the concept on intentionality and its importance to theories of meaning and mental structure. Part of this discussion will involve outlining my reasons for pursuing intentionality as a key component of a successful theory of mental architecture; not all theories of meaning necessarily require intentionality, and those that do need to demonstrate its importance. In response to problems raised by a consideration of intentionality, I will then directly address different representational structures and evaluate their success in achieving intentionality. The representational structures outlined raise the issue of indeterminate causality and its reflection in mental architecture, which is the subject of the third section. In this final section I will illustrate how such representational systems can be successful in understanding the world despite of (and possibly *in virtue* of) this indeterminacy and summarize how intentionality can be understood in these representational systems.