
Preface

Cognitive science is a new field that brings together what is known about the mind from many academic disciplines: psychology, linguistics, anthropology, philosophy, and computer science. It seeks detailed answers to such questions as: What is reason? How do we make sense of our experience? What is a conceptual system and how is it organized? Do all people use the same conceptual system? If so, what is that system? If not, exactly what is there that is common to the way all human beings think? The questions aren't new, but some recent answers are.

This book is about the traditional answers to these questions and about recent research that suggests new answers. On the traditional view, reason is abstract and disembodied. On the new view, reason has a bodily basis. The traditional view sees reason as literal, as primarily about propositions that can be objectively either true or false. The new view takes imaginative aspects of reason—metaphor, metonymy, and mental imagery—as central to reason, rather than as a peripheral and inconsequential adjunct to the literal.

The traditional account claims that the capacity for meaningful thought and for reason is abstract and not necessarily embodied in any organism. Thus, meaningful concepts and rationality are *transcendental*, in the sense that they transcend, or go beyond, the physical limitations of any organism. Meaningful concepts and abstract reason may happen to be embodied in human beings, or in machines, or in other organisms—but they exist abstractly, independent of any particular embodiment. In the new view, meaning is a matter of what is meaningful to thinking, functioning beings. The nature of the thinking organism and the way it functions in its environment are of central concern to the study of reason.

Both views take categorization as the main way that we make sense of experience. Categories on the traditional view are characterized solely by the properties shared by their members. That is, they are characterized

(a) independently of the bodily nature of the beings doing the categorizing and (b) literally, with no imaginative mechanisms (metaphor, metonymy, and imagery) entering into the nature of categories. In the new view, our bodily experience and the way we use imaginative mechanisms are central to how we construct categories to make sense of experience.

Cognitive science is now in transition. The traditional view is hanging on, although the new view is beginning to take hold. Categorization is a central issue. The traditional view is tied to the classical theory that categories are defined in terms of common properties of their members. But a wealth of new data on categorization appears to contradict the traditional view of categories. In its place there is a new view of categories, what Eleanor Rosch has termed *the theory of prototypes and basic-level categories*. We will be surveying that data and its implications.

The traditional view is a philosophical one. It has come out of two thousand years of philosophizing about the nature of reason. It is still widely believed despite overwhelming empirical evidence against it. There are two reasons. The first is simply that it is traditional. The accumulated weight of two thousand years of philosophy does not go away overnight. We have all been educated to think in those terms. The second reason is that there has been, until recently, nothing approaching a well-worked-out alternative that preserves what was correct in the traditional view while modifying it to account for newly discovered data. This book will also be concerned with describing such an alternative.

We will be calling the traditional view *objectivism* for the following reason: Modern attempts to make it work assume that rational thought consists of the manipulation of abstract symbols and that these symbols get their meaning via a correspondence with the world, *objectively construed*, that is, independent of the understanding of any organism. A collection of symbols placed in correspondence with an objectively structured world is viewed as a *representation* of reality. On the objectivist view, *all* rational thought involves the manipulation of abstract symbols which are given meaning only via conventional correspondences with things in the external world.

Among the more specific objectivist views are the following:

- Thought is the mechanical manipulation of abstract symbols.
- The mind is an abstract machine, manipulating symbols essentially in the way a computer does, that is, by algorithmic computation.
- Symbols (e.g., words and mental representations) get their meaning via correspondences to things in the external world. All meaning is of this character.

- Symbols that correspond to the external world are *internal representations of external reality*.
- Abstract symbols may stand in correspondence to things in the world independent of the peculiar properties of any organisms.
- Since the human mind makes use of internal representations of external reality, the mind is *a mirror of nature*, and correct reason mirrors the logic of the external world.
- It is thus incidental to the nature of meaningful concepts and reason that human beings have the bodies they have and function in their environment in the way they do. Human bodies may play a role in *choosing* which concepts and which modes of transcendental reason human beings actually employ, but they play no essential role in *characterizing* what constitutes a concept and what constitutes reason.
- Thought is *abstract* and *disembodied*, since it is independent of any limitations of the human body, the human perceptual system, and the human nervous system.
- Machines that do no more than mechanically manipulate symbols that correspond to things in the world are capable of meaningful thought and reason.
- Thought is *atomistic*, in that it can be completely broken down into simple “building blocks”—the symbols used in thought—which are combined into complexes and manipulated by rule.
- Thought is *logical* in the narrow technical sense used by philosophical logicians; that is, it can be modeled accurately by systems of the sort used in mathematical logic. These are abstract symbol systems defined by general principles of symbol manipulation and mechanisms for interpreting such symbols in terms of “models of the world.”

Though such views are by no means shared by all cognitive scientists, they are nevertheless widespread, and in fact so common that many of them are often assumed to be true without question or comment. Many, perhaps even most, contemporary discussions of the mind as a computing machine take such views for granted.

The idea of a *category* is central to such views. The reason is that most symbols (i.e., words and mental representations) do not designate particular things or individuals in the world (e.g., Rickey Henderson or the Golden Gate Bridge). Most of our words and concepts designate categories. Some of these are categories of things or beings in the physical world—chairs and zebras, for example. Others are categories of activities and abstract things—singing and songs, voting and governments, etc. To a very large extent, the objectivist view of language and thought rests on

the nature of categories. On the objectivist view, things are in the same category if and only if they have certain properties in common. Those properties are necessary and sufficient conditions for defining the category.

On the objectivist view of meaning, the symbols used in thought get their meaning via their correspondence with things—particular things or categories of things—in the world. Since categories, rather than individuals, matter most in thought and reason, a category must be the sort of thing that can fit the objectivist view of mind in general. All conceptual categories must be symbols (or symbolic structures) that can designate categories in the real world, or in some possible world. And the world must come divided up into categories of the right kind so that symbols and symbolic structures can refer to them. “Categories of the right kind” are classical categories, categories defined by the properties common to all their members.

In recent years, conceptual categories have been studied intensively and in great detail in a number of the cognitive sciences—especially anthropology, linguistics, and psychology. The evidence that has accumulated is in conflict with the objectivist view of mind. Conceptual categories are, on the whole, very different from what the objectivist view requires of them. That evidence suggests a very different view, not only of categories, but of human reason in general:

- Thought is *embodied*, that is, the structures used to put together our conceptual systems grow out of bodily experience and make sense in terms of it; moreover, the core of our conceptual systems is directly grounded in perception, body movement, and experience of a physical and social character.
- Thought is *imaginative*, in that those concepts which are not directly grounded in experience employ metaphor, metonymy, and mental imagery—all of which go beyond the literal mirroring, or *representation*, of external reality. It is this imaginative capacity that allows for “abstract” thought and takes the mind beyond what we can see and feel. The imaginative capacity is also embodied—indirectly—since the metaphors, metonymies, and images are based on experience, often bodily experience. Thought is also imaginative in a less obvious way: every time we categorize something in a way that does not mirror nature, we are using general human imaginative capacities.
- Thought has *gestalt properties* and is thus not atomistic; concepts have an overall structure that goes beyond merely putting together conceptual “building blocks” by general rules.
- Thought has an *ecological structure*. The efficiency of cognitive pro-

- cessing, as in learning and memory, depends on the overall structure of the conceptual system and on what the concepts mean. Thought is thus more than just the mechanical manipulation of abstract symbols.
- Conceptual structure can be described using *cognitive models* that have the above properties.
 - The theory of cognitive models incorporates what was right about the traditional view of categorization, meaning, and reason, while accounting for the empirical data on categorization and fitting the new view overall.

I will refer to the new view as *experiential realism* or alternatively as *experientialism*. The term *experiential realism* emphasizes what experientialism shares with objectivism: (a) a commitment to the existence of the real world, (b) a recognition that reality places constraints on concepts, (c) a conception of truth that goes beyond mere internal coherence, and (d) a commitment to the existence of stable knowledge of the world.

Both names reflect the idea that thought fundamentally grows out of embodiment. “Experience” here is taken in a broad rather than a narrow sense. It includes everything that goes to make up actual or potential experiences of either individual organisms or communities of organisms—not merely perception, motor movement, etc., but *especially* the internal genetically acquired makeup of the organism and the nature of its interactions in both its physical and its social environments.

Experientialism is thus defined in contrast with objectivism, which holds that the characteristics of the organism have nothing essential to do with concepts or with the nature of reason. On the objectivist view, human reason is just a limited form of transcendental reason. The only roles accorded to the body are (a) to provide access to abstract concepts, (b) to provide “wetware,” that is, a biological means of mimicking patterns of transcendental reason, and (c) to place limitations on possible concepts and forms of reason. On the experientialist view, reason is made possible by the body—that includes abstract and creative reason, as well as reasoning about concrete things. Human reason is not an instantiation of transcendental reason; it grows out of the nature of the organism and all that contributes to its individual and collective experience: its genetic inheritance, the nature of the environment it lives in, the way it functions in that environment, the nature of its social functioning, and the like.

The issue is this:

Do meaningful thought and reason concern merely the manipulation of abstract symbols and their correspondence to an objective reality, independent of any embodiment (except, perhaps, for limitations imposed by the organism)?

Or do meaningful thought and reason essentially concern the nature of the organism doing the thinking—including the nature of its body, its interactions in its environment, its social character, and so on?

Though these are highly abstract questions, there does exist a body of evidence that suggests that the answer to the first question is no and the answer to the second is yes. That is a significant part of what this book is about.

Why does all this matter? It matters for our understanding of who we are as human beings and for all that follows from that understanding. The capacity to reason is usually taken as defining what human beings are and as distinguishing us from other things that are alive. If we understand reason as being disembodied, then our bodies are only incidental to what we are. If we understand reason as mechanical—the sort of thing a computer can do—then we will devalue human intelligence as computers get more efficient. If we understand rationality as the capacity to mirror the world external to human beings, then we will devalue those aspects of the mind that can do infinitely more than that. If we understand reason as merely literal, we will devalue art.

How we understand the mind matters in all these ways and more. It matters for what we value in ourselves and others—for education, for research, for the way we set up human institutions, and most important for what counts as a humane way to live and act. If we understand reason as embodied, then we will want to understand the relationship between the mind and the body and to find out how to cultivate the embodied aspects of reason. If we fully appreciate the role of the imaginative aspects of reason, we will give them full value, investigate them more thoroughly, and provide better education in using them. Our ideas about what people can learn and should be learning, as well as what they should be doing with what they learn, depend on our concept of learning itself. It is important that we have discovered that learning for the most part is neither rote learning nor the learning of mechanical procedures. It is important that we have discovered that rational thought goes well beyond the literal and the mechanical. It is important because our ideas about how human minds should be employed depend on our ideas of what a human mind is.

It also matters in a narrower but no less important way. Our understanding of what reason is guides our current research on the nature of reason. At present, that research is expanding faster than at any time in history. The research choices made now by the community of cognitive scientists will shape our view of mind for a long time to come. We are at present at an important turning point in the history of the study of the mind. It is vital that the mistaken views about the mind that have been with us for two thousand years be corrected.

This book attempts to bring together some of the evidence for the view that reason is embodied and imaginative—in particular, the evidence that comes from the study of the way people categorize. Conceptual systems are organized in terms of categories, and most if not all of our thought involves those categories. The objectivist view rests on a theory of categories that goes back to the ancient Greeks and that even today is taken for granted as being not merely true, but obviously and unquestionably true. Yet contemporary studies of the way human beings actually categorize things suggest that categorization is a rather different and more complex matter.

What is most interesting to me about these studies is that they seem to provide evidence for the experientialist view of human reason and against the objectivist view. Taken one by one, such studies are things only scholars could care about, but taken as a whole, they have something magnificent about them: evidence that the mind is more than a mere mirror of nature or a processor of symbols, that it is not incidental to the mind that we have bodies, and that the capacity for understanding and meaningful thought goes beyond what any machine can do.