Metaphors of mind

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Conceptions of the nature of intelligence

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This book is dedicated to the members of my research group at Yale, past and present, who have made possible the development of my thinking and research on the nature of intelligence:

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Preface

Some books come quickly, others come slowly. This book came slowly. I first envisioned writing the book during my last year of graduate school at Stanford – in 1975. My plan was to write it during my first year as an assistant professor at Yale, when I signed on to teach an upper level undergraduate course, Theories of Intelligence. But like Tristram Shandy trying to write the story of his life, I found that I could not keep up in my book writing and, in my case, with my teaching. Eventually, I fell hopelessly behind in my writing and was left with rough drafts of four chapters.

The book sat still for a number of years. For a period during the late 1970s and early 1980s, the field seemed to be moving so rapidly forward that I thought any book such as this one that I might write would so quickly become out of date that there was no point to writing it then.

Three years ago, I received a Guggenheim Fellowship to write this book, but found myself not quite ready to write it. Instead I wrote an invited lead article for *Science,* "Human intelligence: The model is the message," which became the basis for the book. Indeed, it was not until after I wrote that article that I realized what form this book would take, a form completely different from what I originally envisioned.

Metaphors of mind: Conceptions of the nature of intelligence is a book about how people in various disciplines, but especially psychology, have viewed intelligence. The main theme is that theories of intelligence are guided by underlying metaphors of mind. To understand the theories and their interrelations properly, one has to understand the underlying metaphors. Moreover, in comparing theories, it is important to distinguish between comparisons that occur within versus across metaphors. Comparing theories across metaphors is much like comparing apples and oranges: Both are fruits, but fruits of a different kind. Similarly, theories guided by, or in some cases even generated by,

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different metaphors are all theories, but of different kinds. Typically, they deal with different aspects of intelligence, and comparisons are somewhat fruitless, much as would be comparing answers to different questions. Although the theories may appear to be answering the same question – What is intelligence? – it turns out that the question really is: What is intelligence as viewed from the standpoint of a particular metaphor? In order fully to understand intelligence, we need to understand that through a skillful blending, as opposed to a haphazard mixing, of the various metaphors, one can make sense of it. This book, therefore, is addressed to students of intelligence who seek to understand what may at times seem to be a bewildering variety of unintegrated and even unintegrable points of view.

There certainly exist many other volumes on the topic of intelligence, including some highly comprehensive ones (Sternberg, 1982a; Wolman, 1985). And there are certainly many accounts of how a model-based approach can be applied to the understanding of the human mind (Chapman & Jones, 1980; Gentner & Grudin, 1985; Roediger, 1980). But I believe that this volume is the first comprehensively to apply a metaphor-based approach to the study of different kinds of theories of intelligence, just as my 1985 *Science* article was the first article to approach this task. The idea of metaphors in conceptualizing intelligence is not new, however, going back at least to Spearman (1927) and, arguably, to Plato in his cave metaphor.

I have attempted to bring together into a systematic and comprehensive framework all of the major theories of human intelligence that have been proposed during the twentieth century and to include as well material on the nature of intelligence that dates back well before the beginning of the twentieth century. The book differs from many others on intelligence in that it attempts to deal solely with alternative conceptions of intelligence and with how they have been guided by metaphors and expressed as definitions and theories. No attempt has been made to deal with the many other issues that confront intelligence research – such as heritability, testing, and training of intelligence – except as these issues directly follow from the definitions and theories to be considered. Thus, these issues are considered as outgrowths of theory, rather than the other way around, as has been conventional in the field of human intelligence.

The book is divided into five main parts. These parts are Introduction, Definitions of intelligence, Theories of intelligence looking inward,

Theories of intelligence looking outward, and Theories of intelligence looking inward and outward.

In Part I, which consists of a single chapter, I deal with the idea of metaphors as providing the underlying foundations for theories of intelligence. I discuss the role metaphors play in science, and in the science of human intelligence in particular. I describe the alternative metaphors that have been used and how they have affected the way intelligence is perceived by various theoreticians and practitioners. I also argue that students of intelligence have often unwittingly fallen victim to their own synecdoches: They have constructed a theory of part of the phenomenon of intelligence and have mistakenly believed their theory to apply to the phenomenon as a whole. Yet any one metaphor cannot possibly serve as a complete basis for understanding any construct, certainly not one as complex as human intelligence.

Part II presents and discusses various pretheoretical ideas about the nature of intelligence. These take the form of definitions, or implicit theories. Definitions of intelligence are essentially ideas about the nature of intelligence that exist in the minds of those who create the definitions. They might be referred to as "implicit theories" because they are theories that exist, in some sense, in people's heads, without being explicitly formalized as scientific theories. People may or may not be aware that they have these implicit theories. But it is important to realize that all explicit theories of intelligence, of the kind discussed in the remainder of the book, originally arise from implicit theories. Even theories that are empirically derived, such as through factor analysis, have their bases in implicit theories, because the implicit theories are what generated the choice of tests, and hence the universe of possible factors, in the first place. Thus, in order fully to understand explicit scientific theories and the metaphors that underlie them, we need first to understand the implicit theories that gave rise to them.

In Chapter 2, I discuss historical views of intelligence, ranging from those of ancient philosophers to those of philosophers at the end of the nineteenth century. Obviously, such a wide-ranging treatment of ideas about intelligence cannot possibly be complete. But it does cover the views of many major thinkers. In some cases, these views may be idiosyncratic, but, for the most part, they are at the heart of Western thought. Often without our even realizing it, these ideas have heavily influenced twentieth-century thinking about intelligence. They are so much a part of our way of thinking and of our assumptions of how we

should understand intelligence that we are hardly aware that these ideas even exist.

In Chapter 3, I discuss contemporary views of intelligence – that is, those of the twentieth century. There are many sources to which one could turn for an understanding of how people in this century have defined intelligence, but I have concentrated on three major sources of thought. The first two are symposia on the nature of intelligence, one of which appeared in the *Journal of Educational Psychology* in 1921 and the other of which appeared in a book edited by myself and Douglas Detterman in 1986. The other main source comes from studies explicitly addressing people's implicit theories of the nature of intelligence. There have been a number of such studies, looking at various groups of respondents and target populations, and these studies give a broad panorama of how people in various walks of life view intelligence as it applies to a variety of populations.

I devote an entire chapter, Chapter 4, to the views of just two early theorists, Galton and Binet, who might be viewed as the forefathers of most contemporary work on intelligence. Galton is most well known for his work at the end of the nineteenth century and Binet for his work at the beginning of the twentieth century, although the two overlapped somewhat in the time span of their work. In order to understand virtually all that has been done on intelligence in the twentieth century, one has to understand the thinking of Galton and Binet. The tension that existed between their contrasting points of view is one that has continued even to the present day in various attempts to understand the nature of intelligence. To a large extent, the conflict between them set the stage for the conflict that was to emerge among contemporary theorists.

Part III is about theories of intelligence that look inward. The four main metaphors looking inward are the geographic, computational, biological, and epistemological. These provide understanding of intelligence in terms of the internal world of the individual – in terms of what goes on inside the head when a person thinks or acts intelligently. To understand intelligence, theorists guided by these metaphors seek to understand mental processes, structures, representations, and content.

Chapter 5 deals with theories guided by a geographic metaphor of intelligence, in which intelligence is understood in terms of a map of the mind. To understand intelligence would be to understand the map that underlies our basic processes of thought, and theorists of intelligence adhering to a geographic metaphor could be viewed as cartographers,

seeking tools to help them create maps that accurately locate and de-
scribe the various abilities that constitute human intelligence. These
cartographers of the mind have not always been quick to realize that,
similar to the physical world, there is no one map or set of coordinate
systems that uniquely portrays a geographic structure. Rather, alterna-
tive mappings are possible, depending on the coordinate system and the
particular phenomena upon which one chooses to concentrate.

Chapter 6 concerns the computational metaphor of mind. The theo-
ries dealt with here view the mind, roughly, in terms of the software of
a computer or other computing device. Some of the theorists explicitly
use computer simulation; others do not. But all share the notion that the
mind, like the computer, is a computational device. Therefore, in the-
ory at least, the mind could be simulated on a computer powerful
enough to represent the mind's complexity. Computational theories
were originally proposed in experimental psychology as an alternative
to stimulus–response and other forms of behavioral theorizing. In the
field of human intelligence, though, they quickly became perceived as
an alternative to psychometric theorizing and, therefore, to what I have
called the geographic metaphor. In their early work, computational
theorists were sometimes disdainful of geographic ones, believing that
what they did served as a replacement for geographic theorizing. In
retrospect, many of these theorists realized that the computational
metaphor is complementary to the geographic metaphor. Computa-
tional processes can be mapped onto geographic structures, and vice
versa, so that the two approaches can be used in conjunction rather
than in mutual exclusion.

The topic of Chapter 7 is the biological metaphor underlying some
theories of intelligence. Some theorists of intelligence have felt that
computational theories do not go far enough – that although they may
tell us something about the workings of the human mind, they do so at
so molar a level that little or no connection can be made with the organ
of intelligence, namely, the brain. Biological theorists seek to make
this connection and hence, in some sense, represent the ultimate in re-
ductionism for the study of human intelligence. In much of the bio-
logical work, the connection between behavioral data and the biology
of the brain proves to be somewhat speculative and is itself meta-
phorical. But in other work, direct mappings of functions to areas of
the human brain are attempted, and some of these have generated
quite a bit of excitement, seeming to isolate portions of the brain that
are responsible for various cognitive and other functions observed in

intelligent behavior. These theories are not really a replacement for computational or geographic ones. To understand the functioning of a car, one might seek a knowledge of molecular structures of the various parts of the car, but one might also seek to map out these various parts or to understand their molar functions. When a car does not start, one seeks to localize the source of the difficulty and the function that is not being performed correctly; one probably does not investigate at a molecular level. As with understanding of the car, understanding of the mind can be sought at multiple levels and in multiple ways, none of which is intrinsically any "better" than any other.

Chapter 8, unlike the other chapters in this book, deals with a metaphor that is largely, although not exclusively, attributable to just a single individual – the epistemological metaphor of Jean Piaget. Although Piaget's work was influenced by biology as well as philosophy, the philosophical underpinnings are stronger, I believe, and the metaphor is largely one that seeks to understand the mind in terms of the structure of knowledge. The obvious advantage of this approach is that the powerful machinery of the field of epistemology can be brought to bear on the study of the mind. The obvious danger is that the structure of knowledge will be confused with the structure of the mind. Indeed, many have argued that Piaget's theory is a theory of human competence rather than of human performance. But whatever may be the case, the epistemological metaphor has proved to be a powerful and influential one in studying thinking. Like the metaphors described above, it was generated largely in response to the geographic metaphor. Indeed, Piaget worked in Binet's laboratory, and his interest in intelligence grew partly as a result of his interest in the bases of wrong rather than right answers in children's responses to questions on the Binet–Simon Intelligence Scale. The epistemological metaphor, as used by Piaget, is the most interactive of the metaphors considered in this part of the book with respect to the relation between the internal and external worlds of the individual, and hence provides a natural bridge to the next part.

Part IV deals with theories of intelligence looking outward. These theories provide understanding of intelligence primarily in terms of the external world of the individual. The theories draw on two main metaphors, anthropological and sociological, although these are not always clearly distinguishable.

In Chapter 9, I discuss the anthropological metaphor for theories of intelligence. Theories guided by this metaphor seek to understand how

culture affects or even determines the nature of intelligence. Those ad-
hering to this metaphor believe that, at minimum, the nature of intelli-
gence differs at least somewhat from culture to culture. At the extreme,
theorists adhering to this metaphor believe that intelligence is essentially
a different thing in one culture versus another. Thus, these theorists are
characterized by the view that the nature of intelligence differs qualita-
tively across cultures. Therefore, direct quantitative comparisons of
levels of intelligence of people in different cultures are often meaning-
less, because the comparisons are on different scales, and deceptive,
because the numbers mean different things for different cultures. Thus,
for these theorists, levels of intelligence can be compared much more
easily within than between cultures. Sometimes even that is difficult,
because individuals may come from different subcultures that stress
different aspects of adaptive behavior as intelligent. Unsurprisingly,
theorists guided by the anthropological metaphor have been highly
critical of theorists who are guided by metaphors of intelligence that
look inward to understand the nature of intelligence, because anthropo-
logically oriented theorists believe that intelligence cannot be under-
stood outside its cultural context. For them, any metaphor that seeks to
understand intelligence simply in terms of the inner mechanisms of
mind misses the critical point that intelligence is not just a set of processes
or structures in the head. Rather, it is in large part a cultural invention.

Whereas the anthropological theorists described in Chapter 9 have
been highly critical of metaphors that look inward, the sociological
theorists discussed in Chapter 10 have been critical particularly of the
epistemological metaphor as applied by Piaget. The most well known
of these theorists, Lev Vygotsky, to some extent argued the opposite of
Piaget's point of view. Whereas Piaget argued that intelligence moves
from the inside outward – that we first learn what needs to be done by
and for ourselves, and that we later externalize it – Vygotsky argued
that we do the opposite – that we learn first from seeing what other
people do, usually in social settings, and then internalize it. In other
words, Vygotsky theorized from the outside inward, whereas Piaget
theorized from the inside outward. Vygotsky emphasized the role of
socialization processes in human intellectual development, as did
Reuven Feuerstein after him, but the idea is that we cannot understand
intelligence unless we understand the social forces that shape it.

Part V covers very recent theories of intelligence that seek simulta-
neously to look both inward and outward. Chapter 11 deals primarily

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with the two most recent: Howard Gardner's theory of multiple intelli-
gences and my own triarchic theory of human intelligence. Each of
these theories tries in a different way to combine aspects of the various
metaphors described above. In effect, they employ a systems metaphor
in which the system consists of the different parts of intelligence as
conceived by a number of various metaphors. Gardner, for example,
draws heavily on the geographic metaphor but uses the biological one
as well. I draw heavily on the computational metaphor but also draw on
the anthropological and sociological ones. But whatever the combina-
tion may be, the paramount idea is not to be locked into one system, but
rather to draw on many systems and thereby seek to obtain a more
nearly full understanding of what intelligence is. In Chapter 12, I dis-
cuss the implications of the metaphorical approach and attempt to show
why it is important to understand theories of intelligence in terms of the
metaphors that guide them.

As is always true, a number of people have contributed to the formation
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