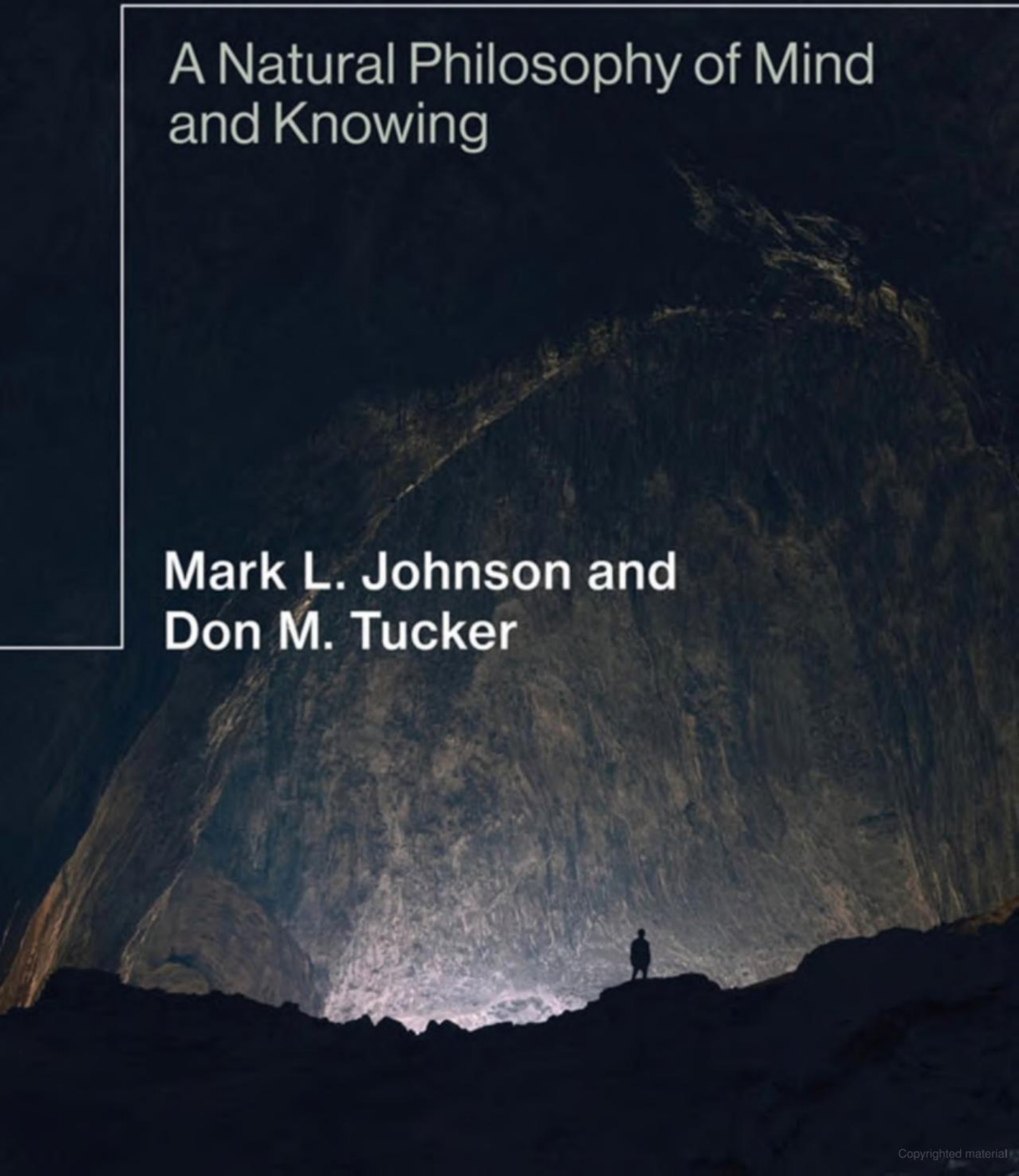
Out of the Cave

A Natural Philosophy of Mind and Knowing



Mark L. Johnson and
Don M. Tucker

Out of the Cave

A Natural Philosophy of Mind and Knowing

Mark L. Johnson and Don M. Tucker

The MIT Press
Cambridge, Massachusetts
London, England

The MIT Press would like to thank the anonymous peer reviewers who provided comments on drafts of this book. The generous work of academic experts is essential for establishing the authority and quality of our publications. We acknowledge with gratitude the contributions of these otherwise uncredited readers.

This book was set in Stone by Westchester Publishing Services, Danbury, CT.

Library of Congress Cataloging-in-Publication Data

Names: Johnson, Mark, 1949- author. | Tucker, Don M., author.
Title: Out of the cave : a natural philosophy of mind and knowing / Mark L. Johnson and Don M. Tucker.
Description: Cambridge, Massachusetts : The MIT Press, [2021] | Includes bibliographical references and index.
Identifiers: LCCN 2020048448 | ISBN 9780262046213 (hardcover)
Subjects: LCSH: Philosophy of mind. | Knowledge, Theory of.
Classification: LCC BD418.3 .J65 2021 | DDC 128/.2--dc23
LC record available at https://lccn.loc.gov/2020048448

Contents

Preface and Acknowledgments ix

1 Toward a Natural Philosophy of Mind 1

1.1 The Folk Theory of Disembodied Knowing 3
1.2 Out of the Cave 4
1.3 The Embodied Mind Perspective 6
1.4 Meaningful Mind Science 7
1.5 The Cautionary Tale of the Two Cultures of the Academy 12
1.6 The Plan of This Book 14

2 The Philosophical Quest for Ultimate Knowledge 21

2.1 The Need for a Theory of Embodied Knowing 21
2.2 The Metaphysics of Eternal, Unchanging Knowledge in a Precarious World 24
2.3 Aristotle's Bifurcation of Theoretical versus Practical Knowledge 31
2.4 Descartes and the Quest for Certainty 34
2.5 The Kantian Turn: Philosophy as Epistemology 39
2.6 The Linguistic Turn Away from the Body 42

3 The Intertwining of Self and Knowledge 45

3.1 The Relation of Self and Knowledge in Modern Philosophy 48
3.2 Descartes's Fixed, Pre-given, Disembodied Self 49
3.3 Hume's No Self 51
3.4 Kant's Co-constitution of Self and World 53
3.5 Toward a Naturalistic Philosophy of Mind and Knowing 63

4 A Pragmatist Naturalistic Framework for Embodied Mind and Knowing 65

4.1 Organism-Environment Interaction as the Source of Experience 67
4.2 Life and Homeostasis within an Organism in Its Environment 69

4.3 Knowing Is Based on Values of the Organism 70
4.4 Knowing in the Context of Need-Search-Satisfaction 70
4.5 The Social Constitution of Mind 74
4.6 Knowing as a Process of Learning the Meaning of Things 82
4.7 Knowing as Intelligent Experiential Transformation 83
4.8 The Stages of Reflective Inquiry and the Reduction of Indeterminacy 85
4.9 Knowing as Embodied, Situated, Intelligent Action 90

5 The Challenge of a Meaningful Science of Mind: The Quest for an Objective Human Science 93

5.1 Toward a More Meaningful Cognitive Science 96
5.2 The Natural Subjective Perspective in American Pragmatism 98
5.3 Freudian Insight, Hubris, and the Rejection of Psychoanalysis 99
5.4 Unconscious Bias and the Critical Logic of Objective Truth 101
5.5 Psychology's Ideal of Pristine Objectivity 103
5.6 Machines Like Us 104
5.7 First-Generation Cognitive Science 105
5.8 Second-Generation Cognitive Science: From Cognitive Neuroscience to Natural Philosophy 107
5.9 Cognitive Neuroscience in Dialogue with the Humanities 109
5.10 Artificial Intelligence and the Fifth Revolution 110
5.11 Realizing the Embodied Self 112

6 Embodied Meaning and Thought 115

6.1 The Body in the Mind 115
6.2 Image Schemas as Embodied Meaning Structures 117
6.3 Body-Based Action Concepts 123
6.4 The Simulation Theory of Meaning and Thought 125
6.5 Embodied Abstract Concepts: Conceptual Metaphors 128
6.6 Conceptual Metaphors for Mind 134
6.7 Conceptual Metaphors for Knowing 140
6.8 The Cognitive Unconscious 144

7 The Mind's Anatomy 147

7.1 Nature's Evolutionary Developmental Process 148
7.2 Levels of Neural Organization 153
7.3 The Integration of Mind at the Limbic Core 159
7.4 Interpreting the Mind's Connectional Architecture: How Expectations Shape Perception 164

8 How Information Is Captured by Neural Networks 169

8.1 Deep AI 172
8.2 Levels of Human Knowing 176
8.3 Cognitive Control at the Limbic Core 177
8.4 The Unconscious Consolidation of Experience 180
8.5 The Motivated, Value-Laden Roots of Cognition 183
8.6 The Anatomy of Subjective Experience 184
8.7 Shifting Attention between Visceral and Somatic Constraints 187
8.8 The Adaptive Unconscious: A Summary 189

9 The Motive Control of Experience 193

9.1 Motive Control of Neural Development 193
9.2 From Reflex to Uncertainty 200
9.3 Learning Is Cognition, and Cognition Is Motivated Expectancy 202
9.4 The Two-Way Process of Memory Consolidation 203
9.5 Knowing Favors the Prepared Mind 205
9.6 The Limbic Control of Uncertainty 208
9.7 Dual Corticolimbic Pathways for Tuning Expectancy 210
9.8 The Expansive Holism of Elation 214
9.9 The Focus of Anxiety 216
9.10 Tonic and Phasic Modes for Managing Uncertainty 217
9.11 Elation and Context Learning 219
9.12 Anxiety and Object Learning 221
9.13 Implicit Adaptive Controls and the Feeling of Knowing 223

10 What Is a Concept? The Influence of Motive Control on the Formation of Concepts and Personality 229

10.1 Developing the Structure of Abstract Concepts through Differentiation and Integration 230
10.2 Motive Control in Simple Actions 237
10.3 Motive Control in Personal Decisions 240
10.4 The Unconscious Process of Adaptive Self-Control 244
10.5 Mind Emerges from the Concrete Unconscious 246
10.6 The Semantic Scaffold 253
10.7 The Continuity of Neural Control 256

11 Abstraction, Self-Awareness, and the Subjective Basis of Knowledge 259

11.1 Abstraction Is the Process of Concept Formation 260
11.2 Complexity of Knowledge Creates Complexity of the Self 264

11.3 The Subjective Cost of Knowledge 266
11.4 Abstraction through Self-Awareness 266
11.5 Self-Regulating the Motive Control of Conscious Intent 270
11.6 Personality and the Adaptive Control of the Executive Functions 274
11.7 The Intersubjective Construction of Self and World 276
11.8 The Process of Knowing in Science 279
11.9 The Dialectical Progress of Scientific Knowledge 281
11.10 The Subjective Foundations of Objective Knowledge 285

12 Outline for a Contemporary Natural Philosophy of Mind and Knowing 287

12.1 A Scientific Epistemology 288
12.2 Implications for the Nature of Mind and Knowing 289
12.3 Who Are We? Knowing in the Embodied Mind 303

References 307
Index 323

Preface and Acknowledgments

This book is the result of several years of conversation and collaboration between a philosopher with pragmatist sympathies (Mark Johnson) and a psychologist and neuroscientist (Don Tucker). Don initiated the dialogue by suggesting that some of his experimental research supported the general philosophical and linguistic perspective emerging in Mark's work on how our bodies shape mind, thought, and language in a deep and pervasive way. We shared the conviction that it was now possible to craft a natural philosophy (i.e., an empirically grounded theoretical and practical explanation) of mind and thought that could explain how people actually process meaning and how they understand their world through their intimate visceral bodily engagement with their surroundings.

We were attracted by the possibility of explaining human nature, as well as our individual selfhood, as the result of two processes: (1) our ongoing evolutionary history that provides the architecture of our bodies and brains and (2) our individual cognitive and affective development over the course of our lives, which sculpts our neural networks. This evolutionary-developmental approach is at the core of modern theoretical biology, and it provides the basis for a natural philosophy that explains how brain architecture and neural connectivity give rise to mind, conceptualization, and reasoning.

This new natural philosophy of mind was not made from whole cloth, as if it sprang ex nihilo from a conceptual analysis of cognition. Its origin instead was a cobbling together of insights from biological psychology, evolutionary theory, neural modeling, research on cognitive predictions, affective neuroscience of emotions, the science of animal motivation, and research on how values shape meaning, thought, and knowing. No single method or body of experimental research was sufficient. What was required was a search for convergent evidence arising from multiple approaches and perspectives.

As we discussed what such a natural philosophy of mind would involve, it became clear that it would require a radical rethinking of certain traditional views about human cognition and behavior. We began to explore the implications of this new perspective on mind for the nature of consciousness, thought, meaning, language, knowledge, basic values, and the exciting yet troubling aspects of the burgeoning Age of Information in which we find ourselves. Realizing that we couldn't adequately manage all of this in a single book, we decided to focus on the fundamental questions of what *mind* is and how it is possible to *know* anything. That alone was plenty to keep us occupied, but it became obvious that you cannot pursue these matters without also saying something about all of the other issues we had been discussing. So, along the way, we have taken up topics such as the nature of selfhood, consciousness, motivation, information, meaning, abstraction, concepts, and more.

As an example of the radical implications of embodied mind, you cannot talk about mind without talking about selfhood. The *self* as conceived in this evolutionary and developmental framework could not be a fixed and static entity possessed of unique powers of thought. Indeed, the self cannot be a *thing* or entity at all. Instead, it emerges as a pattern of ongoing processes of organism-environment interaction, processes that are at once biological, interpersonal, and cultural. The self is always in process, and it changes with each activity of inquiry and knowing that it unleashes on its environment. As we shared our research and discussed various problems we were struggling with, we glimpsed the possibility of synthesizing several bodies of recent philosophy, psychology, and neuroscience into a view of human mind that was entirely nondualistic, embodied, and rooted in biological and social values.

Moreover, if the self is always in process, continually attempting to accommodate changing conditions and events in experience, then knowing is a motivated activity—an ongoing process—shaped by our deepest biological and cultural values, geared toward survival and enhanced well-being. Knowing cannot be an internal re-presentation of a prior fixed and finished reality, but rather is a means of reconstructing experience in adaptation to changing conditions. This makes knowing an exploratory, transformative, and projective process that must remain fallible and subject to subsequent correction, in light of newly emerging circumstances. Knowing is thus not a static relation of mind and world, but rather a process that

and doings have grown from our humble foundations in biology and the cultural context in which our biology takes shape.

We are immensely grateful to those who provided feedback on various versions of the manuscript, especially Tim Hicks, who gave us detailed and insightful comments that guided our earliest revisions. One anonymous reviewer supplied extremely helpful criticisms and suggestions. Above all, we are very much in debt to Jill Swenson of Swenson Book Development, who had a major role in making this book far less bloated, less pontifical, and, we hope, much clearer and more compelling than when we started out. We especially appreciate her comment that we should stick with the evidence and not act like used car salesmen overhyping our product. There no doubt remains some enthusiastic hype, but through her remarkably detailed and constructively critical editing, Jill kept us focused on presenting relevant evidence. We also express our gratitude to Anne Awh for the lovely illustrations she created for the book.

1 Toward a Natural Philosophy of Mind

Mind is fundamentally embodied. The beauty of the body and its world creating the mind is wondrous to behold. Everything we experience, know, feel, value, and do is the result of bodily processes of which we are seldom aware, but without which we could neither survive nor have meaningful lives.

As recently as thirty years ago, this was a radical claim. Human cognition was too often studied without any serious understanding of how our bodies shape both *what* and *how* we think, learn, and know. Today, scientific research supports and elaborates the view that mind and thought are embodied social processes. In this book, we attempt to summarize some of the exciting recent research that reveals how all of our higher-level cognitive activities are rooted in our bodies through processes of perception, motive control of action, and feeling.

We propose that a naturalistic theory of mind may unify the story of the human condition provided by the sciences and the humanities. When it is fully formed, this theory will explain how self-consciousness, conceptualization, language, reasoning, and knowledge could arise out of, and operate through, many of the same bodily processes we share with other mammals. The most complex levels of human cognition are organized through basic mammalian patterns of organism-environment interactions, combined in powerful abstractions within human bodies and brains. There are multiple levels of functional organization that make up what we call "mind." Consequently, we need multiple levels of inquiry (e.g., biology, psychology, phenomenological description, neuroscience, and neural network modeling) to understand what goes on at each level of increased complexity and functional emergence.

The resulting natural philosophy of mind situates all cognitive activities in ongoing, value-laden transactions with our biological, interpersonal, and cultural environments. Important insight comes from seeing how these highly complex functions are possible because they appropriate patterns and processes of our sensory, motor, and affective operations to construct abstract conceptualization and reasoning. The emerging neurobiological evidence, when organized within the perspective of a natural philosophy, provides a twenty-first-century answer to the ancient injunction to "Know Thyself."

From biology we understand how the process of mind in our daily reflections is the product of a long history of mammalian evolution that has generated the specific capacities for perception, bodily movement, emotions, feelings, thought, imagination, and language. Mind is not fixed and finished, but rather an evolving biological, cultural, and technological process. As we learn new things through our activity in the world, our brains are continually rewired in the ongoing development of experience. Each new conceptual organization is a new subjective understanding with implications for personal identity. Consequently, changes in knowledge are changes in who we are.

For many centuries, philosophers have taken mind and intelligence to be unique to humans, though perhaps granting limited mind-constituting capacities to certain "higher" animals (e.g., dogs, cats, dolphins, horses, ravens). However, with the arrival of artificial intelligence, our conceptions of mind now face new and intriguing challenges. Intelligent systems based on neural models can perform many of the cognitive functions we previously took to be exclusive to humans, and, in many cases, these computational systems outperform us mere mortals. In addition, the new field of *extended mind* research argues that mind is not locked up in individual brains and bodies, but instead extends beyond the confines of skin and skull out into informational structures in our environment, such as when we off-load memory, computation, and situational awareness onto our phones and tablets.

These rapidly changing developments in intelligent systems are at once marvelous and scary. In our hectic, information-flooded daily existence, some people become anxious over the way informational technologies seem to be taking over their lives. It is not just that we cannot keep up with new devices, but rather that these technologies define and control our values, goals, practices, and modes of communication without our knowledge or permission. Many scientists anticipate the day when computers will

become conscious agents capable of self-directed activity that rival humans for control of their environment.

As it merges with biologically based cognitive science, the new computational science requires us to rethink many of our most deeply held assumptions. The concept of human nature is at stake here. We need to understand the implications of this artificial intelligence revolution for our grasp of the nature, purpose, and value of biologically and socially embodied human knowledge.

1.1 The Folk Theory of Disembodied Knowing

Given the importance of knowing for understanding our place in the world, it may seem surprising that hardly anyone can give an adequate account of the knowing process. Most people have only the barest clues to how mind and thought work, and this is true even for many who have taken courses in philosophy, psychology, and neuroscience. Mostly, we pick up bits and pieces about the nature of mind and knowledge that have been passed down over the last several generations. These unstated assumptions have become a widely accepted *folk theory*, which assumes that we have knowledge of something when we form ideas in our mind that correspond to how things are in our world. Acts of knowing are taken to be purely intellectual operations, rather than bodily processes. Over the past 2,700 years, philosophers and, more recently, psychologists and other cognitive scientists have developed more sophisticated versions of this simplified model of knowing. Yet, the core tenets have persisted over history and constitute what might be called the *folk theory of disembodied knowing*:

- From birth, humans begin to acquire skills for carrying out practical tasks (*procedural* knowledge or knowing *how* to do something), and they later develop capacities for theoretical understanding of their world (declarative knowledge or *knowing that* something is the case).
- *Knowing how* is geared toward changing the world through your actions, whereas *knowing that* provides an objective, impartial understanding of what exists, why things are the way they are, and why they behave as they do.
- Theoretical knowledge is believed to be the product of rational processes that represent, or mirror, reality.

development. Exiting the cave requires us, first, to give up the myth of pristine objectivity and absolute knowledge, and, second, to launch ourselves out into our natural world in ways that are attuned to what our world affords us by way of survival, flourishing, and pursuit of well-being. Getting out of the cave is learning our place in the natural world.

1.3 The Embodied Mind Perspective

We review research in biology, cognitive science, neuroscience, and computational neural modeling to show how human minds are embodied in the deepest possible way. It is not only perception, feeling, and bodily movement that are rooted in structures and processes in our bodies and brains. The same holds for conceptualization and reasoning, which are also grounded in and shaped by our embodiment. Mind is an emergent functional organization of body-based processes.

The same sensory, motor, and affective processes underlying perception and action are recruited for so-called cognitive activities of conceptualization and reasoning. As we will argue in the pages that follow, abstract thought is not a transcendence of the body, but rather is inherently the result of body-based meaning making. All of the affective and cognitive operations we perform—from simple perception to our most impressive intellectual and artistic achievements—are affairs of the embodied mind. *What* we think and *how* we think depends on our brains and bodies as they operate in our physical, social, and cultural environments.

Our bodies provide our primary animate situatedness in the world (Sheets-Johnstone 1999). Out of organism-environment interaction arises the meaning we make of experience and all of the reason of which we are capable. Grasping the meaning of our surroundings makes it possible to survive, grow, move forward, instigate actions, and coordinate with other creatures in joint cooperative activities. Knowing is our way of trying to find our place in our surroundings. We will present evidence that knowing is based on expectancies developed over the course of our experience, which are then evaluated in relation to present experiences in our perceptual and motor interface with our world. We readily know what we can predict.

But when our lived experience fails to meet our preestablished expectancies, we have to recalibrate those expectancies so they are more in line with

the actual course of experience. This is a different, more critically based mode of inquiry and knowing.

Most of the time, both our expectancies and our recalibrations happen automatically beneath the level of our conscious awareness. However, with the emergence of abstract thinking and language use, this process of self-adjustment in light of new experiences can sometimes be brought to reflective awareness, thereby becoming subject to conscious articulation and control. The very possibility of science depends on this capacity to be reflectively aware of this expectancy-testing-adjustment operation.

Knowing is about developing a suitably rich and deep understanding of the meaning of your surroundings (physical, social, and cultural) that enables you to function more or less successfully. When we find ourselves stuck in a situation because our habits and familiar expectancies fail to manage the current conditions, the challenge is to make a fresh inquiry into ways we might adjust our expectancies and habits in order to restore our effective agency in the world. Knowing is then a *doing*—an active transformation of our experience from a condition of indeterminateness, uncertainty, and confusion to a condition of restored fluid activity necessary for us to function well within our world. This conception of knowing as intelligent doing was set out by the pragmatist philosophers in the late nineteenth and early twentieth centuries. We have adopted John Dewey's brand of pragmatist philosophy for its merits in framing an appropriate philosophical perspective on knowing that is consonant with our current science. As we study the brain's mechanisms for prediction and testing the evidence of the world, we will see how the sources of knowledge are profoundly embodied, personal, practical, and activity oriented. This bodily basis remains the foundation, no matter how abstract or esoteric our knowledge might be. Whether in mathematics, logic, science, or the arts, the process of mind is an embodied, value-based process.

1.4 Meaningful Mind Science

Of all the marvelous expressions of mind, perhaps the most important is *knowing*. Our goal is to clarify the everyday process of knowing—about ourselves and the world—by understanding how this process emerges from the brain's biological workings, its adaptive mechanisms. Our goal is an account of mind and knowing that is both scientifically supported and existentially meaningful—an account that helps us to understand what it means to be

human and that bears directly on how we ought to live. Making a science of the mind meaningful for subjective experience is a challenge. It is one that has not been addressed very well by either philosophy or psychology, and perhaps even less so by neuroscience. Nonetheless, we think that discovering the nature and meaning of the process of knowing should be among the most important challenges for philosophers and psychologists. What follows are some key desiderata for a meaningful science of mind.

1. *Meaningful mind science must appreciate and explain the role of subjective experience in knowing.*

In science generally, and in psychology specifically, subjectivity has been avoided, as if admitting it would taint the scientific method. This avoidance reflects an error in our understanding of what a scientific psychology ought to involve.

Scientific knowledge can never be value neutral, but it can seek validation within knowledge communities (e.g., scientific disciplines, artistic communities, philosophical traditions, and technologies) and transcend limitations of personal assumptions, values, or interests.

Subjective experience weaves feelings, perceptions, motives, actions, and reasoning into the process of knowing. An important requirement for an adequate scientific theory of the human mind is a full account of all of its causal influences, including the urges, motives, and desires that are integral to personal experience. We will see that in order to frame a theory of mind and knowing with biological principles, we must understand how the brain's cognitive capacities—for attention, memory, and planning—are only possible because they are regulated by motive controls. These are the neural control systems that evolved to direct behavior for the essential tasks of survival and reproduction. They generate the emotional qualities and motive directives of subjective experience, and they drive learning. Motive controls give direction and meaning to our thinking and knowing.

2. *Meaningful mind science must give an account of the whole person who knows.*

First-generation cognitive science was relatively disembodied and focused primarily on cognition (e.g., concepts, propositions, logic, information processing, and artificial intelligence; Varela, Thompson, & Rosch 1991). Second-generation *embodied* cognitive science and neuroscience moves toward an appreciation of the entire human being, based on a deep understanding of embodied subjectivity (Feldman 2006; Lakoff & Johnson 1999).

A similar broadening of horizons has occurred with the emergence of embodied cognition theory and cognitive linguistics (Feldman 2006; Johnson 2007; Lakoff 1987; Langacker 1987–1991, 2002). As cognitive neuroscience has increased recognition of the importance of the brain and the biological basis of human nature, embodied cognition theory has provided a deeper appreciation of the phenomenology of our bodily engagement with the world and increased recognition of the key role of emotions and feelings in meaning, thought, and language (Damasio 1994, 1999, 2010). This approach leads to a more holistic understanding of the human experiences incorporated in the mind. Mind is the whole organism in interactions with its environment, rather than a narrow vehicle for rational thought (Gallagher 2005; Lakoff & Johnson 1999).

3. *Science and philosophy must coevolve.*

In her groundbreaking book *Neurophilosophy* (1989), Patricia Churchland optimistically looked forward to a creative coevolution of philosophy and cognitive neuroscience. These fields are finally catching up to her vision. A broader philosophical analysis may improve the science of the mind by making it more self-critical, while advances in cognitive neuroscience allow us to place the philosophy of mind on a more rigorous scientific basis. Our biological functions give rise to our subjective experience of self, thought, and knowing. Principles of biology explain key aspects of the mind's processes and structures in relation to the brain's function. These same principles lend insight into how we process personal experience, meaning, and behavior. A principal goal of this book is to understand the human brain in the context of the biological and social processes that generate and shape our subjectivity.

4. *Meaningful mind science must recognize the central role of values and feelings in knowing.*

One of the more important discoveries of a biologically based cognitive science is the central role of values in determining *what* we know and *how* we know it (Damasio 1999, 2003; Tucker 2007; Tucker & Luu 2012). Knowledge depends on our ability to evaluate evidence to learn whether it confirms or denies our expectancies and hypotheses. Mid-twentieth-century philosophy of science has shown there is no such thing as complete and final confirmation of a theory, though some theories can be rejected on the basis of falsifying evidence (Kuhn 1962; Popper 1959).

Yet, evidence isn't enough. We can gather evidence in the form of measurements, images, or statistics, but this may remain just raw data, not information, if it fails to have meaning in the context of the questions we bring. To be significant, the process of knowing must be grounded in meaning.

From a philosophical perspective, the meaning of something is grounded in the experience it evokes. This meaning helps to interpret past and present experiences, and what it portends for future (possible) experiences. Meaning is relational—it involves relations among experiences *for a person*. Therefore, knowledge is about both *relations in the world* and a *person's relations to that world*. To have meaning, information must have personal value. Dry, irrelevant data isn't meaningful. It remains as data. Instead, the most meaningful things are the valued properties of experience, the things about which we care deeply. To be meaningful, knowing must therefore be grounded in our values.

Values have an important basis in emotions and feelings (Damasio 2003, 2018). As we will see in the following chapters, today's cognitive neuroscience is teaching us to find the elementary basis of value judgments in the brain's biological roots, the motive regulatory systems. These motive systems give rise to familiar but complex phenomenological (experiential) patterns in our emotions and mood states. They engage integral regulatory controls provided by the brain's motivational circuits, including the visceral controls from the limbic system and the chemical neuromodulator systems of the brain stem.

There is a growing body of empirical research showing that gaining knowledge depends as much on motivation as on native intelligence. To understand how information gains meaning, which is crucial to the process of knowing, we must therefore appreciate the emotional and motivational controls that guide cognition. These controls are not only integral to effective thinking, but they become organized and abstracted in complex ways in the conceptual structures of our values.

5. *Meaningful mind science must appreciate the psychological experience of information in reducing indeterminacy and anxiety.*

Another critical dimension arises when we process information. The root of the term "information" is *in-form*, meaning to change the form of the mind. We can begin with the technical definition of information in computer science. In Claude Shannon's mathematical theory of communication (Shannon and Weaver 1949), the *information* of a message is

The intellectuals of modern societies, including teachers and professors in our colleges and universities, seem to gravitate to one intellectual skill at the expense of the other. In remarking on the English educational system of the 1950s, C. P. Snow described the sciences and the humanities as the two cultures of the academy (Snow 1959). He criticized his humanist colleagues for failing to understand the most basic scientific discoveries, even as he criticized the scientists' ignorance of the world's literary understanding of human values and cultures.

In the study of human nature, scientists and humanists often find themselves on opposite sides of a deep divide in what stands for knowledge. As we have begun our analysis of the process of knowing in terms of the dual skills of understanding evidence and understanding values, it seems clear that these are not easily developed together.

A lesson from the continued separation of the two cultures in the modern era may be that we naturally gravitate to different relationships with knowledge. On the one hand, knowing is a personal, subjective relationship, where knowledge has felt meaning for understanding ourselves and who we think we are. This is the position of the humanities, where the emotional and value implications may be the most important feature of knowledge, leading knowledge to be relative to the person's or culture's values. Carried to the extreme, this emphasis leads to the absolute cultural relativism of much postmodern humanities discourse.

On the other hand, knowledge for the scientist is too often strictly a matter of evidence. Theory is of course necessary. Yet, the history of science shows that most scientists will be dragged into a new theoretical framework only by the crushing weight of irrefutable evidence. There is precious little insight into the subjective process of knowing and the implicit values that shape the mind's conscious products.

As we propose that the process of knowing requires both the understanding of evidence and the clear motivation from articulated values, we join Snow in rejecting the two cultures of the academy. Science must strive for objective knowledge, with skill in understanding the evidence, to be sure. Yet, when it is applied to the human mind, science should be expected to provide insight into the process of knowing, including what appears to our subjective perspective. Similarly, the humanities are concerned with the search for human meaning in the subjective aspect, with the complexities that accrue to individual minds in their unique cultural contexts. Yet, those

humanists who are ignorant of the progress of the science of the mind risk missing crucial explanations of how the uniquely human mind has evolved and how individual development within a culture then shapes our capacities for meaning, valuing, thought, and language.

Despite the continuing separation of the two cultures, there are some promising recent developments that provide examples of a fruitful collaboration between the sciences (e.g., biology, neuroscience, and cognitive science) and humanistic disciplines (e.g., literary theory, ethics, and social theory) (Fauconnier & Turner 2002; Slingerland 2008; Turner 1991; Wehrs & Blake 2017). Works such as these show that a cooperative interaction is both possible and highly desirable.

1.6 The Plan of This Book

The natural philosophy of mind is emerging through the convergence of biology, psychology, computer science, and philosophy. Our goal with this book is not just to chronicle this emergence, but also to contribute to it, with original ideas that may help carry it forward. To start with a basis in philosophy for the general reader, chapter 2 will review classical questions about the nature of knowledge, along with a critique of the proposed answers that have shaped the collective Western intellectual tradition that we all share. Chapter 3 then takes on the key issue of the relation of the knower to what is known. Even though we want our knowledge to be objective, and not just a matter of opinion, an important theme in philosophy has been appreciating how the self is implicit in each person's process of mind. This role of the embodied, social self in forming concepts will be a key theme throughout the book.

A good philosophy is not just a collection of ideas, but a system, a coherent way of knowing. In chapter 4, we outline the philosophy of American Pragmatism (especially that of John Dewey) as a candidate for the best example of a complete philosophy that is fully compatible with scientific evidence and theory, on the one hand, and with the questions that arise from personal experience, on the other. Although it was most fully developed at the beginning of the twentieth century, Pragmatism still may offer a model for a philosophy that addresses the big questions while remaining open to the new insights of scientific inquiry.

As psychology developed as a science, you might think it would have started from the big questions that Pragmatism framed so clearly, such as how our abstract knowledge could emerge from our biological capacities, how our values come to guide our appraisals of important situations, or how we search for new knowledge based on what we already know. In chapter 5, as we frame some of the issues in the development of psychology as a science for the general reader, we find this presented quite a challenge to psychologists. To be scientific, as we will see, most research psychologists decided they had to start with more limited, behavior-based questions that presuppose a somewhat impoverished view of experience.

As a result, the academic psychology of the twentieth century was dominated by a fairly narrow approach, where subjective experience was seen as mostly irrelevant, and behaviorism denied mental life as a topic for science. Even as cognitive science emerged in the second half of the century, it did so by rejecting humanistic questions altogether. At about the same time, the "analytic" approach in philosophy attempted to reduce the questions of the basis for knowing to objective logic of propositions and semantic constructions. In both approaches to achieving pristine objectivity, subjective meaning was sacrificed.

In chapter 6, we consider some of the extensive evidence for the embodiment of mind, thought, and language that has emerged over the past four decades, within what is known as embodied cognition theory. Much of this evidence comes from cognitive linguistics, which investigates how meaning, thought, and language arise from sensory, motor, and affective processes. This body-based meaning is then recruited for abstract thought via conceptual metaphors that use structures and processes in a sensory or motor domain to structure our understanding of an abstract target domain. Conceptual metaphor thus turns out to be an essential process of human abstraction, while remaining firmly embodied. This primarily linguistic evidence for the embodied mind sets the context for the subsequent neuroscience accounts in the remaining chapters of how thought arises in neural tissues and bodily structures and processes.

To frame the biological basis for a natural philosophy of mind, chapter 7 then digs into the anatomy of the human brain. We explore the hypothesis that brain and body architecture supports the basic functions of mind. Mammalian evolution has so far resulted in the current functional

organization of the human brain capable of activities of perception, bodily movement, action planning, inference, and more. Neuroanatomy reveals how the hierarchical organization of different types of sensory and motor cortex gives rise to perception and action. One of the most important discoveries is the central role of the limbic system in providing the motivational and value-shaped unifying context for these perceptual and motor processes. Basically, the sensory and motor networks of the neocortex regulate the traffic with the external world (in perception and in action), while the visceral networks of the limbic cortex regulate the brain's traffic with the internal milieu of bodily needs, such as the maintenance of homeostasis. This suggests that all cognition is driven by our deepest motivational processes and our deepest biological and social values.

To consider the motivated, biological process of mind in more detail, chapter 8 then reviews current ideas on how motive controls regulate memory and cognition. One novel implication is that the process of knowing cannot proceed without motive control. The separation of cognition from motivation and emotion turns out to be an academic pretense—something that philosophers and psychologists might wish to be true but biologists are learning is not possible. The positive implication is that we can explain the role of values in organizing experience, with a new explicitness that is refreshing as well as instructive for an account of situated, value-based modes of knowing.

In order to align the motive control of cognition and memory with the anatomy we studied in chapter 7, the analysis in chapter 8 draws from current theory in computational neuroscience to consider how experience shapes the vast, constantly changing, neural connectivity among functional brain regions. This research supports the theory of *predictive coding* to suggest how the process of mind is implemented across the linked networks of the limbic system and neocortex. One significant implication is that all our knowing is motivated by our biological and social values. Another is that knowing involves the projection of expected events, which are then assessed in relation to actual experiences and recalibrated when there is a discrepancy between predictions and actual events. This is the deepest, most fundamental basis for inquiry and knowing.

Chapter 9 delves more deeply into the motive control of bodily behaviors and how that motivational structure is appropriated for higher cognitive functions, such as conceptualization and reasoning leading to knowing. These deep motivational processes underlie our acts of knowing, both as

unconscious regulatory processes and in our conscious reflective modes of inquiry. These ideas follow directly from the functional neuroanatomy of chapter 7 and the cognitive and computational neurophysiology of chapter 8, and they help us become more aware of the roots of our thinking and knowing in emotions, feelings, values, and motivational systems. The motive controls that we found to regulate bodily behavior also structure our conceptual thinking. We think by feeling. When we feel elated, we can think expansively and then predict the big picture of the impending future; when we feel anxious and uncertain, we can focus and then exercise caution in critical thought. Although these are novel ideas, they follow directly from the anatomy and biology that we review, which provides new insights into the phenomenology of personal experience.

Chapter 10 explores what concepts become, once we realize that they are an essential part of the basic motivational, value-driven control of thought and action. Concepts are patterns of neural connectivity based on past experiences that establish expectancies concerning which experiences will be associated with particular objects, events, and actions. Concepts are thus predictions about what specific objects or events will afford us by way of experience. They depend on our values and interests, and they are tools for the maintenance and transformation of experience. Once we appreciate that concepts are both motivated and value dependent, we can investigate how motivational and affective processes operate, not just in our unconscious processes of perception and action, but also in our personal decisions and cognitive styles of thought. This explains why, in personality development, some folks manifest more impulsive and extraverted modes of self-regulation that foster a more impressionistic and holistic integration of conceptual structure, while others adopt more constrained and introverted modes of self-regulation that favor more analytic and focused forms of cognition, suggesting greater differentiation in conceptual structure and therefore greater analytic attention to detail.

Abstraction involves both hierarchical organization and unifying integration of different parts or dimensions of a thing. In chapter 11, we follow up Piaget's suggestion that abstraction requires some measure of self-awareness, which only develops fully in the second decade of a child's life. Abstraction requires that we stand back from the holistic identification of self and object experienced as an undifferentiated sense of elation. We have to suspend this blending of self and world temporarily and take up a more critical

2 The Philosophical Quest for Ultimate Knowledge

2.1 The Need for a Theory of Embodied Knowing

Our goal is a scientific account of the development of the brain and body as the basis for knowledge, in both its objective dimension rooted in our engagement with the world and in its subjective dimension as meaningful for our lives. We address the role of the body in meaning, perception, experience, learning, conceptualization, self-awareness, selfhood, values, and anything connected with what is colloquially termed "mind." In later chapters we will explore how some of the structures and processes of the always-developing brain give rise to various modes of understanding and knowing. This account reveals that all our knowing is *embodied* (rooted in our bodies and brains), *embedded* (incorporating and interacting with our environment), *enactive* (continually generating experience and selfhood), and *value based* (grounded in our motivational and emotional systems and geared toward action in the world). Knowing of this sort is engaged, practical, existentially charged with meaning, and intimately tied up with our developing selfhood. It is a full-bodied, full-blooded exercise in learning the meaning of our world.

It is disconcerting to discover that philosophy, until quite recently, has had almost no engagement with the scientific research of the sort we describe in this book. Philosophy has long prided itself on being the discipline best equipped to tell us what knowledge consists in and how it works. Instead, what one too often finds are armchair analyses of our culturally learned concepts of meaning, knowledge, reference, and truth, but without any serious grounding in the cognitive sciences. Peruse any text or anthology that takes an Anglo-American analytic philosophy approach and you find there is an initial distinction drawn between kinds of knowledge (e.g., knowing that

vs. knowing how vs. knowing by acquaintance). Usually, this is followed by an assertion that *knowing that* is the primary mode of objective knowledge of the world, so that the principal focus should be on how it is possible for inquirers to justify certain propositional claims as known and true.

As a representative example of this kind of focus of contemporary epistemology, consider the opening lines of the entry on the analysis of knowledge from the *Stanford Encyclopedia of Philosophy*:

> The project of analysing knowledge is to state conditions that are individually necessary and jointly sufficient for propositional knowledge, thoroughly answering the question, what does it take to know something? By "propositional knowledge", we mean knowledge of a proposition—for example, if Susan knows that Alyssa is a musician, she has knowledge of the proposition that Alyssa is a musician. Propositional knowledge should be distinguished from knowledge of "acquaintance", as obtains when Susan knows Alyssa. The relation between propositional knowledge and the knowledge at issue in other "knowledge" locutions in English, such as knowledge-where ("Susan knows where she is") and especially knowledge-how ("Susan knows how to ride a bicycle") is subject to some debate (see Stanley 2011 and his opponents discussed therein).
>
> The propositional knowledge that is the analysandum of the analysis of knowledge literature is paradigmatically expressed in English by sentences of the form "S knows that p", where "S" refers to the knowing subject, and "p" to the proposition that is known. A proposed analysis consists of a statement of the following form: S knows that p if and only if j, where j indicates the analysans: paradigmatically, a list of conditions that are individually necessary and jointly sufficient for S to have knowledge that p. (Ichikawa & Steup 2018)

This summary passage is a perfect example of the perspective, focus, and style of analytic philosophy treatments. It acknowledges other kinds of knowing, but focuses almost exclusively on descriptive (propositional) knowledge. Its central concern is how propositional knowledge claims can fit (or fail to fit) an objective state of affairs in the world. Finally, it says nothing about what knowledge means to us, and completely ignores the crucial subjective components of knowing that make knowledge relevant and important for our lives. An ordinary person, unschooled in the abstruse, abstract, and formal intricacies of contemporary analytic philosophy, might wonder what any of this has to do with knowing as it operates in our daily lives. How did philosophy come to narrow its scope and methods so much that it overlooks most of the body and brain processes that make knowing possible and meaningful? Why did it come to focus only on justifying one particular type of knowledge claim, namely, propositional assertions? How

did philosophy of knowledge become primarily an "S-knows-that-p" epistemology? How did philosophy become so alienated and detached from our ordinary practical lives, in which knowing is a doing—an activity—and a profoundly personal and emotional affair?

It behooves us to take a brief journey back through some key events in philosophical treatments of knowledge that have profoundly influenced how we think about knowledge, culminating in an almost exclusively conceptual and propositional focus. It would be hard to overstate the difference between the embodied notion of understanding and knowing that we propose in this book and traditional proposition-based accounts of knowledge. Propositions do sometimes play an important role in our knowledge practices, but, as we will argue later, these have to be understood and explained in relation to the kinds of embodied motivational processes that we will identify as central to all kinds of knowing, and not merely to propositions. In other words, language-centered knowledge practices actually depend on mostly unconscious, prereflective, and value-based embodied modes of knowing. So, instead of starting (and ending) only with propositions and linguistic phenomena, we argue for the need to start with body-based knowing and eventually build up to propositional knowledge, which is itself a form of embodied knowing.

To see how contemporary epistemology got off track, we need to examine some important historical moments in philosophical treatments of knowledge that led the entire field of epistemology to ignore or downplay the crucial role of embodiment, motivation, emotions, values, and action in what and how we know.

We focus on four profoundly fateful moments in Western epistemology (Plato, Aristotle, Descartes, and Kant), which set the course for subsequent attempts to explain knowledge. We suggest that classical Greek philosophy left us with an ontology (a theory of being) according to which our world divides neatly into two fundamentally different and separate ontological realms. One is the temporally embedded and always changing perceptual realm of experience and bodily action. The other is an allegedly intelligible realm of eternal, unchanging, and fixed essences graspable by mind. The perceptual realm consists of objects and events causally interacting and changing over time. Because it is variable and changing, the perceptual realm cannot supply any fixed standard of knowledge, and it is therefore taken to be the basis of mere belief and opinion associated with practical

affairs of living. The intelligible realm is regarded as transcending time and change, thereby providing the possibility of unchanging universal objective knowledge. The distinction between theoretical knowledge and practical knowledge fits well with the supposition of two different realms. Theoretical knowledge is an intellectual grasp of fixed and eternal essences, whereas practical knowledge focuses on the contingencies of everyday activities in which we seek to achieve our practical ends and goals. Practical modes of engaging the world are deemed epistemically inferior because they deal with contingencies and probabilities, rather than necessities and certainties.

2.2 The Metaphysics of Eternal, Unchanging Knowledge in a Precarious World

Although there are historical antecedents in pre-Socratic philosophy, we begin with Plato's and Aristotle's more elaborate and influential articulations of knowledge as rooted in a realm of unchanging essences. In *The Quest for Certainty* (1929/1984), John Dewey described, in a detailed, nuanced, and highly insightful manner, the general context in which classical Greek views of knowledge emerged and have, in various forms, been carried forward into the present day. He opens the book with an important general observation about how the human condition—precarious and fraught with peril—drives us to seek some means by which to manage the uncertainties and contingencies of life. "Man who lives in a world of hazards is compelled to seek for security" (3). One is reminded of the Hebrew lament, "Yet man is born unto trouble, as the sparks fly upward" (Job 5:7, King James Version). At birth, we are thrown into a world that continually challenges our ability to make sense of it and to control the forces that affect our lives for better and worse. No sooner do we get settled into habits of perceiving, thinking, and doing than new conditions emerge to unsettle those habits, requiring us to reconfigure ourselves or our surroundings if we hope to come back into relative harmony with our environment.

The early Greeks were painfully aware of life's perils and difficulties. They lived in a puzzling and confusing world subject to the whims of gods. They propitiated the gods with prayers and offerings in the hope that they would look kindly on them in the face of life's many uncertainties and difficulties.

Yet, even in the midst of such relentless peril and bewilderment, the earliest Greek nature philosophers, in the seventh and sixth centuries BCE

particular kind of thing was determined by the mathematical properties and relations that defined it. For example, the so-called Pythagorean theorem (namely, that for any right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides) could be materially demonstrated, in a sense, by drawing squares on each of the three sides of a right triangle and then cutting up the squares of the two shorter sides and showing that they exactly fit into the square drawn on the hypotenuse. Hence, the Pythagoreans concluded that reality ultimately has a mathematical character, and physical objects are constituted by their mathematical properties and relations—a view that persists to the present day in theoretical physics, where reality is held to be describable in mathematical terms and equations.

Plato appropriated this Pythagorean perspective in his ontological and epistemological hierarchy of levels of greater and lesser being that are accessed by greater or lesser modes of knowing and belief. This picture of the nature of reality and our knowledge of it was set out most famously in Plato's *Republic*, in the sections on the Allegory of the Cave (Book VII) and the Metaphor of the Divided Line (Book VI). Recall the allegory (*Republic* 514ff.), as illustrated in figure 2.1.

Men dwell for their entire existence in a dark cave, fettered so that they can only view the wall at the bottom of the cave. Behind them burns a fire,

Figure 2.1
Plato's Allegory of the Cave.

and between them and the fire lies a wall upon which people move and carry objects. The shadows cast upon the cave wall constitute the sole perceptual content of the cave dwellers. For these cave dwellers, those shadows constitute reality. Imagine, then, that one of the fettered men is released from his bonds and turns around to face the fire. He will be blinded and confused, but gradually his eyes will adjust to a reality he had not before imagined possible as he learns to see physical objects, people, and the fire. If he tries to relate this world to the captives below, they will deny it and heap scorn upon him. If the newly released cave dweller were then to be dragged up out of the cave to the sunlit world outside, he would again suffer temporary blindness and disorientation before adjusting to this new world of light. Finally, he would realize that the sun, the ultimate source of all light, is, metaphorically, the ultimate source of our knowing. Socrates summarizes for Glaucon the meaning of the allegory: "The realm of the visible should be compared to the prison dwelling, and the fire inside to the power of the sun. If you interpret the upward journey and the contemplation of things above as the upward journey of the soul to the intelligible realm, you will grasp what I surmise since you were keen to hear it" (*Republic* 517b, Grube translation, 170) (Grube & Reeve 1974).

Plato appropriates and extends the common conceptual metaphor KNOWING IS SEEING. Ideas are understood metaphorically as visible physical objects, knowing is metaphorically seeing the features of an idea-object, and the "light of reason" shining on idea-objects is what makes knowledge possible. The one who possesses genuine knowledge, rather than mere opinion, "sees" (i.e., via the metaphor, *knows*) the forms or essences that define objects and events. Coming to genuine knowledge is metaphorically conceived as movement from mere physical seeing of perceptual objects to the intellectual vision of the ultimate essences that make things what they are.

This account is based on an ontological dualism of the visible versus the intelligible realms. Socrates had earlier, at the end of Book VI, employed the Metaphor of the Divided Line to explain how various levels of knowledge operate. Imagine a line divided into unequal parts, and let the top part stand for the intelligible realm and the bottom for the visible. Then, divide each of the two unequal parts again, using the same proportions as the original cut. We then have four regions that decrease in size proportionally from top to bottom (see figure 2.2). The four different sizes of the levels are meant to represent the degree of reality of the objects in that domain and

Plato's Theory of Knowledge:
The Metaphor of the Divided Line
(*Republic* 509d–511e)

	Objects	Modes of Thought
Intelligible World (of things thought) [Realm of Knowledge]	Ideas, Forms [Essences of things in nature]	Reason [Reveals unity of all ideas/ forms; and so transcends any hypotheses]
	Thought-Objects (e.g., mathematical and geometrical objects)	Thought [Reasons from hypotheses and is not unconditional because it rests on assumptions]
Visible World (of things seen) [Realm of Opinion]	Things = Physical objects	Belief [Based on sense experience and so not full knowledge of the object]
	Images = Shadows and reflections	Conjecture (Imagining)

Figure 2.2
Plato's Metaphor of the Divided Line.

the corresponding degree of knowledge possible at that level. Given these four unequal domains, we can thus indicate, on the left, the four levels of mental processes (relative to knowing) and, on the right, four corresponding levels of objects known.

At the lowest level in the visible realm (which also corresponds to the lowest level of the cave), we have our capacity for image making or imagination (*eikasia*), which grasps mere images, shadows, and reflections of things. One level up in the visible is opinion and belief (*pistis*), which gives us an awareness of objects of sense perception. Because these first two levels concern changing objects of the perceptual world, they give us belief and opinion but not knowledge. Moving up to the third level, *dianoia*, we reflect on the realm of perceivable physical objects and enter the lowest level of the intelligible realm, where we use our rational capacity for mathematical and scientific thinking. This is a level of genuine knowledge, but it always remains hypothetical, perspectival, and partial, since any mathematics or science rests on some set of assumptions. At the highest level, we supposedly employ our intellect (*nous*) to grasp the forms or essences of things, not by inferential reasoning but by a sort of direct grasp (a metaphorical seeing) discerned through a process of dialectical argument. And if, per impossible for humans, we could see the ultimate and total relation of all forms and essences in one vast metaphorical vision, we would grasp what Plato calls the ultimate Form of the Good.

The key point in reminding ourselves of these two closely related Platonic models of knowledge (the Cave and the Divided Line) is to appreciate how they depend on a rigid demarcation between the visible and intelligible realms that supports a view of knowledge as pertaining only to that which is fixed, complete, and eternal—the forms or ideas (essences) of things accessed in the intelligible realm.

Plato's theory also supplied a notion of *degrees of being* forming a hierarchy from nonbeing to contingent beings and on up to necessary and unchanging being, which then supposedly corresponds to correlative levels of knowing, from mere imagining up to grasp of the unchanging forms. There thus arose the strange (to our contemporary sensibilities) notion that there are degrees of reality, such that some objects or entities possess more or greater being (or reality) than others. This view was later incorporated into Christian (esp. Thomistic) theology. God, as ultimate reality, is the creator and sustainer of all that exists. Humans, on the other hand, get both

their essence (what they are) and their existence (act of existing) from God. So, they are doubly dependent on God as Being itself, or pure act of existing. In this Great Chain of Being, animals fall below humans in being nonrational and less self-actualizing, and inanimate objects fall at the bottom of the scale as passive entities lacking most of the excellences of active, self-moving, and rational beings. For humans, it is our intellect, not our body, which makes us most God-like, insofar as we are able to grasp the unchanging essences that make things what they are.

It was a short step from the Pythagorean focus on the mathematical relations of objects to the Platonic postulation of two different realms of being, "a higher realm of fixed reality of which alone true science is possible and of an inferior world of changing things with which experience and practical matters are concerned" (Dewey 1929/1984, 14). Knowledge in its full sense was of the eternal essences, while knowledge in a lesser sense (as mere opinion and belief) was of the characteristics of objects subject to change. Within this classical framework, to know something, then, is not merely to encounter the ways it appears to your sensible, physical, ever-changing body, but rather to grasp in the intellect the form or unchanging essence of what the thing really is.

As a result of this radical bifurcation, there followed the correlative split between knowing as the theoretical grasp of eternal forms and the practical belief appropriate for conducting our mundane affairs. "To these two realms belong two sorts of knowledge. One of them is alone knowledge in the full sense, science. This has a rational, necessary and unchanging form. It is certain. The other, dealing with change, is belief or opinion; empirical and particular; it is contingent, a matter of probability, not of certainty" (Dewey 1929/1984, 17).

2.3 Aristotle's Bifurcation of Theoretical versus Practical Knowledge

Aristotle appropriates the Platonic assumption that knowledge in the fullest sense must be of what is unchanging and exists of necessity.

> We all suppose that what we know is not even capable of being otherwise. . . . Therefore the object of scientific knowledge is of necessity. Therefore it is eternal; for things that are of necessity in the unqualified sense are all eternal; and things that are eternal are ungenerated and imperishable. . . . Scientific knowledge is, then, a state of capacity to demonstrate. (Aristotle 2009a)


image
not
available

is good and expedient in respect of life in general, cannot involve scientific demonstration:

> Now no one deliberates about things that are invariable, nor about things that it is impossible for him to do. Therefore, since scientific knowledge involves demonstration, but there is no demonstration of things whose first principles are variable (for all such things might actually be otherwise), and since it is impossible to deliberate about things that are of necessity, practical wisdom cannot be scientific knowledge. (*Nicomachean Ethics* 1140a)

Notice Aristotle's fateful and highly problematic conclusion: the highest form of knowledge of the world (through scientific demonstrative reasoning) is separate and different from the wisdom that helps us to lead meaningful and intelligent lives. We will see in later chapters how much this divorce of knowledge from meaning for our lives has persisted down to the present day and has reinforced inadequate accounts of how we are able to know something. We are left, then, with an ontological split between the fixed realm of eternal essences and the messy, variable world of contingent human actions and practices. Scientific knowledge is a theoretical grasp of these fixed essences and their relations, whereas practical reasoning deals with "things which are only for the most part true" (*Nicomachean Ethics* 1094b). To many, such a distinction will seem perfectly obvious, since it constitutes a recurring folk theory of being and knowing in Western intellectual traditions. However, the consequences of drawing this line between the invariable and the variable have been devastating in Western epistemology because they attribute a fixity and necessity to certain realities that subsequent empirical research will reveal to be false or at least highly questionable. As we will see, the belief that one can gain absolute knowledge of anything leads to a fundamentally mistaken conception of human knowing—a conception that assumes a radical split between theory and practice, knowing and doing. Our argument for knowing as embodied, enactive, and transformative will emerge as we develop our biologically based theory of mind.

2.4 Descartes and the Quest for Certainty

The idea that knowledge in the proper sense—knowledge of the essential being of things—concerns objects that are what they are by necessity is often closely aligned with the idea that we can have certain, indubitable, unshakeable knowledge of those things. Not surprisingly, those who claim that certain and absolute knowledge is possible have often modeled it on their

conception of mathematics, which they believe to be the ultimate, universal language for the description and explanation of being. Since the seventeenth century, the most famous and influential version of this assertion has been René Descartes's (1595–1650) argument that it is possible to attain knowledge that cannot be subject to doubt. In *Rules for the Direction of the Mind* (1628) and *Discourse on Method* (1637), Descartes expresses his disappointment that all of the claims to absolute knowledge he had surveyed, over the course of his education, in all fields of human endeavor, were never able to make good on their claims to unquestionable foundations. Of philosophy, he says "seeing that it has been cultivated for many centuries by the best minds that have ever lived, and that nevertheless no single thing is to be found in it which is not subject of dispute, and in consequence which is not dubious, I had not enough presumption to hope to fare better there than other men had done" (*Discourse on Method*, 1637/1970, 85–86).

Undaunted by this long history of failed attempts to find a method capable of guaranteeing certain knowledge, Descartes turns to his training in mathematics for the clue to a new starting point: "of all those who have hitherto sought for the truth in the Sciences, it has been the mathematicians alone who have been able to succeed in making any demonstrations, that is to say producing reasons which are evident and certain" (*Discourse on Method*, 1637/1970, 92–93). Descartes's method is to subject all claims to knowledge to critical examination, in search of something which is beyond all doubt and can be regarded as necessary and certain truth. His procedure was "to accept nothing as true which I did not clearly recognize to be so: that is to say, carefully to avoid precipitation and prejudice in judgments, and to accept in them nothing more than what was presented to my mind so clearly and distinctly that I could have no occasion to doubt it" (92). Psychologically, this amounts to transcending any anxiety that might arise from indeterminacy and ambiguity in experience. This is an impossible task because, as we will see, the anxiety of doubt is built into our deepest systems of motivational control.

The starting point for all knowledge is what Descartes calls the mental operation of *intuition*, which is an unmediated grasp of the truth of some idea or proposition.

> By intuition I understand, not the misleading judgment that proceeds from the blundering constructions of imagination, but the conception which an unclouded and attentive mind gives us so readily and distinctly that we are wholly freed from doubt about that which we understand. Or, what comes to the same thing,

> intuition is the undoubting conception of an unclouded and attentive mind, and springs from the light of reason alone. (*Rules for the Direction of the Mind*, 1628/1970, 7)

Notice that although Descartes took this account of intuition to be a literal truth, his entire perspective depends on a common conceptual metaphor of KNOWING IS SEEING, in which we conceive of acts of understanding and knowing metaphorically as acts of visual perception based on the following mappings across the source domain of vision and the target domain of knowledge:

The KNOWING IS SEEING Metaphor

- Ideas Are Objects
- Knowing Is Seeing
- Reason Is A Natural Light
- Intellectual Acuity Is Visual Acuity
- Intellectual Confusion Is Blockage or Impediment to Seeing Something

According to the KNOWING IS SEEING metaphor, if some idea-object is viewed by the mind's eye in sufficient light of reason, then we cannot help but know that idea. The metaphor-based logic is precise, and Descartes follows it out in every detail, concluding that "our inquiries should be directed, not to what others have thought, nor to what we ourselves conjecture, but to what we can clearly and perspicuously behold and with certainty deduce; for knowledge is not won in any other way" (*Rules for the Direction of the Mind*, 1628/1970, 5).

Intuition alone is not sufficient for building up a foundation of certain knowledge. As an act of quasi-vision, it gives us some true and certain propositions, but we have to connect those propositions into chains of reasoning that are themselves truth preserving and immune to doubt. Descartes calls this reasoning process *deduction*, by which he means "all necessary inference from other facts that are known with certainty" and which "are deduced from true and known principles by the continuous and uninterrupted action of a mind that has a clear vision of each step in the process" (*Rules for the Direction of the Mind*, 1628/1970, 8). Notice that deduction introduces a temporal dimension into reasoning that is not present in the intuitive "seeing" of a proposition as true in a single act (of metaphorical vision) at a point in time. Descartes understands deduction as a stepwise process of moving from

one intuitively envisioned idea to another, and this introduces a different metaphor, namely, DEDUCTION IS STEPWISE MOTION ALONG A PATH (see Lakoff & Johnson 1999, ch. 12, for a fuller analysis of Descartes's metaphorical conception of knowledge). Consequently, Descartes ends up claiming that reliable deduction consists of running over in the mind inferential steps (each of which is intuitively clear) so quickly that they asymptotically approach something like a single momentary intuitive vision of all the connections. The clash of these two foundational metaphoric assumptions (i.e., INTUITING IS SEEING versus DEDUCTION IS STEPWISE MOTION ALONG A PATH) is based on the ontological and epistemological discrepancy between an instantaneous act of intuition versus a temporally extended operation of deductive inference. Descartes, recognizing this problem, tries to turn deduction into an instantaneous vision of intuitive connections:

> For this deduction frequently involves such a long series of transitions from ground to consequent that when we come to the conclusion, we have difficulty in recalling the whole of the route by which we arrived at it. This is why I say that there must be a continuous movement of thought to make good this weakness of the memory. . . . To remedy this I would run over them [the inferential connections] from time to time, keeping the imagination moving continuously in such a way that while it is intuitively perceiving each fact it simultaneously passes on to the next; and this I would do until I had learned to pass from the first to the last so quickly, that no stage in the process was left to the care of the memory, but I seemed to have the whole intuition before me at one time. (*Rules for the Direction of the Mind*, 1628/1970, 19)

We present Descartes's metaphor-based account of foundational knowledge as "seeing" some eternal object as representative of the recurring desire to find something so necessary, so certain, and so unchanging that, once clearly grasped, it can never be doubted. There is no such thing, but that has not stopped people from yearning for something beyond all time and place, (established by God or Nature or Reason) that manifests an ultimate rational order underlying all reality.

It is a significant irony that Descartes, who thought he was offering a literal, disembodied account of mind and knowledge, in fact has a theory that is entirely dependent on metaphors that understand intellectual cognition in terms of bodily perceptual and motor activities. In chapter 6 we will argue that such body-based metaphors are the stuff of abstract understanding and reasoning generally, so that any account of mind and knowing must