Coherence in Thought and Action

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Preface

This book is an essay on how people make sense of each other and the world they live in. Making sense is the activity of fitting something puzzling into a coherent pattern of mental representations that include concepts, beliefs, goals, and actions. I propose a general theory of coherence as the satisfaction of multiple interacting constraints and show that the theory has numerous psychological and philosophical applications. Much of human cognition can be understood in terms of constraint satisfaction as coherence, and many of the central problems of philosophy can be given coherence-based solutions.

Chapter 1 outlines the importance of the concept of coherence for philosophy and psychology and proposes *cognitive naturalism* as a unified approach to answering philosophical and psychological questions. Chapter 2 develops the cognitive theory of constraint satisfaction as coherence. Chapters 3 and 4 address important philosophical problems concerning the nature of knowledge and reality. Justification of our claims to knowledge is based on five kinds of coherence: explanatory, conceptual, analogical, deductive, and perceptual. These also provide the means to evaluate claims about the nature of reality, for example concerning the existence of the external world, other minds, and God.

Chapter 5 shows the relevance of coherence to philo-

sophical and psychological problems in ethics and politics, arguing that ethical and political judgments are appraisals based on deliberative coherence as well as on the kinds of coherence described in chapter 3. Such appraisals concern not only what to believe, but also what to do, and hence address coherence in action as well as thought. Chapter 6 proposes a new theory of emotional coherence, according to which our appraisals of people, things, and actions emerge from judgments of coherence. It also contends that beauty in science and art is a matter of emotional coherence. Chapter 7 discusses how people who disagree about scientific and other issues can form a consensus on the basis of coherence and communication. Chapter 8 contrasts the coherentist approach to causal inference with probabilistic approaches, particularly Bayesian networks. Finally, chapter 9 suggests some directions for future research on how ideas if about coherence can contribute to progress in philosophy and psychology.

The result, I hope, is a highly coherent theory of coherence. Here briefly is what the book aims to do:

- Provide a far more general and precise account of coherence than has previously been available.
- Increase understanding of how human minds make sense of the way the world is and what to do in it.
- Develop coherence-based answers to central problems in epistemology, metaphysics, ethics, politics, and aesthetics.
- Use ideas about coherence to unify philosophical and psychological problems and to integrate cognition and emotion.
- Understand how consensus can be reached, and identify why it is often difficult to achieve.
- Explain the relation between coherence and probabilistic reasoning.

I hope it all makes sense.

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For various chapters of this book, I have adapted parts of the following articles:

Thagard, P. (1998). Ethical coherence. *Philosophical psychology* 11: 405–422. Reprinted with permission of Carfax Publishing Company. Appears in chap. 5.

Thagard, P. (2000). Probabilistic networks and explanatory coherence. *Cognitive Science Quarterly* 1: 91–114. Reprinted with permission of Hermes Science Publishing. Appears in chap. 8.

Thagard, P., Eliasmith, C., Rusnock, P., and Shelley, C. P. (forthcoming). Knowledge and coherence. In R. Elio (ed.), *Common sense, reasoning, and rationality* (vol. 11). New York: Oxford University Press. Appears in chap. 3.

Thagard, P., and Kunda, Z. (1998). Making sense of people: coherence mechanisms. In S. J. Read and L. C. Miller (eds.), *Connectionist models of social reasoning and social behavior* (pp. 3–26). Hillsdale, N.J.: Erlbaum. Reprinted with permission of Lawrence Erlbaum Associates. Appears in chap. 4.

Thagard, P., and Verbeurgt, K. (1998). Coherence as constraint satisfaction. *Cognitive Science* 22: 1–24. Reprinted with permission of the Cognitive Science Society. Appears in chaps. 2, 3.

Coherence in Thought and Action

1 *Coherence in Philosophy and Psychology*

At the start of the twentieth century, the disciplines of psychology and philosophy were beginning to separate from each other. Originating in the laboratories of Wilhelm Wundt and William James in the 1870s, experimental psychology had grown rapidly in Germany and the United States. Whereas physics became an experimental subject in the 1600s, it took several more centuries before the investigation of mind also became experimental. The nature and operation of mind had been a central concern of philosophers since Plato, and philosophers should have been excited by the eruption of empirical information. Instead, philosophy went its own way, distancing itself from experimental studies of mind and denying their relevance to traditional problems such as the nature of inference and knowledge.

The two main movements of twentieth century philosophy, analytic philosophy and phenomenology, were explicitly antipsychological. Analytic philosophy became dominant in English-speaking countries, establishing a methodology that emphasized logical or linguistic conceptual analysis as central to philosophical investigation and pushing the study of mind into the background. In Germany and later in France, the philosophical approach of phenomenology, originated by Husserl, set itself the task of describing phenomena of conscious experience in order

to grasp their ideal meaning. Both analytic philosophy and phenomenology clearly separate philosophy from empirical psychology, establishing philosophy as a conceptual, nonempirical enterprise.

Although analytic philosophy and phenomenology are still widely practiced and taught, intellectually they have fallen on hard times in recent decades. Both have declined into focusing on internal puzzles and historical retrospectives. In contrast, philosophy of mind and allied areas have been reenergized by regaining contact with empirical psychology, particularly with cognitive psychology, which began to supersede behaviorism in the mid 1950s. Cognitive science has emerged as the interdisciplinary study of mind and intelligence, embracing artificial intelligence, linguistics, anthropology, and neuroscience, as well as psychology and philosophy. Now, at the beginning of a new century, it is clear that psychology and philosophy have many fruitful interconnections.

This book explores one such interconnection involving the role of coherence in thought. I use a computational theory of coherence to illuminate both the psychological task of understanding human thinking and the philosophical task of evaluating how people ought to think. The purpose of this introductory chapter is to explain why coherence is a crucial concept for both philosophy and psychology, and to outline the view I call *cognitive naturalism*, which embraces the symbiosis of psychology and philosophy.

1 COHERENCE IN PSYCHOLOGY

People frequently make inferences about what to believe and what to do. Suppose you are trying to decide whether to buy a used car from someone. You need to be able to infer whether the car is in good condition, partly by relying on your own observations and partly by relying on what the seller says about the car's history, maintenance, and repair records. Whether you believe the seller depends on how trustworthy he or she seems to be, which depends on the inferences you make concerning what kind of person the seller is and whether he or she is telling the truth in this instance. On the traditional account of inference that has been with us since Aristotle, your inferences are a series of steps, each with a conclusion following from a set of premises. Part of your chain of inference might be something like this: The seller looks honest. So the seller is honest. So what the seller says is true. So the car is reliable. So I will buy it.

Another view of inference understands it differently, not as the sort of serial, conscious process just described, but as a largely unconscious process in which many pieces of information are combined in parallel into a coherent whole. On this view, your inference about the car and its seller is the result of mentally balancing many complementary and conflicting pieces of information until they all fit together in a satisfying way. The result is a holistic judgment about the nature of the car, the nature of the seller, and whether to buy the car. Such judgments are the result of integrating the diverse information you have to deal with into a coherent total package. Whether you believe what the seller says about the car will depend in part on what you can infer about the car and vice versa.

Talk of holism and coherence might sound rather mystical, but I am not proposing a kind of New Age cognitive psychology. As chapter 2 describes, coherence-based inference can be characterized just as rigorously as traditional, logic-based inference. Moreover, much of human thinking is naturally understood as coherence-based, in domains as diverse as social impression formation, scientific-theory

choice, discourse comprehension, visual perception, and decision making. Later chapters will show how these and other kinds of human thinking can be understood in terms of coherence processes. A precise and psychologically plausible theory of coherence has much to contribute to cognitive, social, and developmental psychology. One benefit, described in chapter 6, is a unified account of cognition and emotion.

2 COHERENCE IN PHILOSOPHY

Philosophy differs from psychology in that it is traditionally concerned with normative questions about how people should think, not just descriptive questions about how they do think. At the center of this normative concern is justification: are we justified in having the beliefs that we have acquired, and how can we justify the acquisition of new beliefs? For many philosophers, justification is a matter of finding the right foundation consisting of a set of indubitable beliefs from which other beliefs can be inferred. Two sources of certainty have been pursued: reason and sense experience. Rationalists such as Plato and Descartes attempted to use reason alone to achieve foundations of knowledge that could provide sources of justification for other beliefs. In contrast, empiricists such as Locke, Berkeley, and Hume took sense experience as the foundation for all knowledge.

Today, it is generally recognized that both of these foundational approaches to justification are failures. There are no indubitable truths of reason of the sort that Plato and Descartes sought, and even if there were, they would be too trivial to provide a basis for all the other things we think we know. Similarly, there are no indubitable truths of sense experience, and sense experience alone is too meager a foundation for the rich theoretical knowledge we achieve in science and everyday life. Rationalism and empiricism are both defective theories of knowledge.

The failure of foundational epistemologies has impelled many philosophers, including Hegel (1967), Bradley (1914), Bosanquet (1920), Neurath (1959), Quine (1963), BonJour (1985), and Harman (1986), to pursue an account of justification in terms of coherence. Our knowledge is not like a house that sits on a foundation of bricks that have to be solid, but more like a raft that floats on the sea with all the pieces of the raft fitting together and supporting each other. A belief is justified not because it is indubitable or is derived from some other indubitable beliefs, but because it coheres with other beliefs that jointly support each other. Coherentist justification applies not only to particular beliefs, but also to the justification of particular kinds of deductive and inductive inference (Goodman 1965), and to the justification of ethical principles on the basis of how well they fit with ethical judgments and background knowledge (Rawls 1971). To justify a belief, inferential practice, or ethical principle, we do not have to build up from an indubitable foundation; rather we merely have to adjust our whole set of beliefs, practices, and principles until we reach a coherent state that Rawls calls *reflective equilibrium*.

Coherentist justification of this sort is much more promising than the foundationalist approach, but there is also something philosophically unsatisfying about it. In contrast to the neat Euclidean picture of foundational axioms yielding a set of fully justified axioms, we have vague talk of everything fitting together. What does it mean for a belief or practice or principle to be part of the maximally coherent set? How is coherence maximized? The term "reflective equilibrium" is apt for describing a state in which the maximally coherent state has been

achieved, but it provides no insight on how to achieve it.

Chapter 2 provides a much more precise account of coherence as constraint satisfaction, along with algorithms for computing coherence. Later chapters show how different kinds of coherence, employing different kinds of representations and constraints, cover the most important areas of philosophical thought. My aim, however, is not just to describe the logic of coherence, but to give a psychologically plausible account of how coherence mechanisms operate in the human mind. A computational and naturalistic account of coherence can help not only with traditional philosophical problems of justification, but also with psychological concerns about how the mind works. Before undertaking that task, however, some preliminary remarks about the relation of philosophy and psychology are in order.

3 WHY PHILOSOPHY ABANDONED PSYCHOLOGY

It is commonly believed that in the nineteenth century psychology emerged from philosophy, just as physics, chemistry, and biology had earlier used experimental methods to develop beyond philosophical speculation. In contrast, Reed (1997) argues that it is more accurate to say that philosophy emerged from psychology. The history of philosophy before 1900 is dominated by figures who approached epistemological and metaphysical issues in tandem with questions concerning the nature of mind: Plato, Aristotle, Descartes, Hobbes, Locke, Berkeley, Hume, Kant, and Mill, to name just a few. For these thinkers, philosophy and psychology clearly were not separate disciplines. Similarly for the founders of experimental psychology such as Wundt and James, philosophy and psychology were intimately connected. The connection was broken by the development of schools of philosophy that were explicitly antagonistic to any influence of empirical psychology on philosophy.

The two most influential approaches to philosophy in the twentieth century, analytic philosophy and phenomenology, were both formed in reaction to a view disparaged as *psychologism*. Through the influence of Frege and Russell, formal logic became established as a philosophical tool viewed as much superior to psychology for the understanding of inference and the structure of knowledge. Husserl, the founder of phenomenology, began his career discussing the nature of mathematical knowledge in the philosophical/psychological tradition of Brentano, but quickly shifted, partly as a result of Frege's criticisms, to an a priori, nonexperimental investigation of consciousness. Thus the emergence of antipsychologism in twentieth-century philosophy was actually a break with much of the previous history of the subject.

Why did philosophers make this break? It would be superficial to give a purely sociological explanation, although there certainly were concerns among philosophers that their power and influence were waning in comparison to the emerging psychologists. In the United States, the American Philosophical Association was formed *after* the American Psychological Association, and specialty philosophical journals such as *Philosophical Review* were started years after the *American Journal of Psychology* (Wilson 1990). Philosophers in German universities circulated a petition in 1913 to urge that the growing practice of appointing psychologists to philosophy professorships be stopped (Ash 1995, Kusch 1995). Institutionally, philosophers were undoubtedly threatened by the growth

of experimental psychology, but there are deeper, more conceptual explanations of why philosophy became antipsychological.

For both Frege and Husserl, avoiding psychology was essential for establishing objective truths. Frege's *Basic Laws of Arithmetic*, published in 1893, began with a diatribe against what he called the "psychological logicians," whom he accused of writing logic books that are "bloated with unhealthy psychological fat that conceals all more delicate forms" (Frege 1964, 24). On his view, "the laws of truth are not psychological laws: they are boundary stones set in an eternal foundation, which our thought can overflow, but never displace" (1964, 13). Knowledge of arithmetic has nothing to do with psychology, Frege claimed, but is purely a matter of logic. Similarly, Husserl in 1913 made a sharp distinction between psychology and his enterprise of "pure phenomenology," which he intended to establish "not as a science of facts, but as a science of essential Being," leading the way to "Absolute Knowledge" (Husserl 1962, 40–41). Logical and phenomenological approaches both promised to provide philosophy with a priori knowledge, which no work tainted with empirical psychology could achieve.

The decades have not been kind to either of these ambitious enterprises. Gödel showed in 1931 that logic was insufficient for the foundations of arithmetic, and indubitable a priori truths of the sort sought by Frege, Husserl, and many other philosophers have been elusive. At best, the only defensible a priori truths are trivialities such as "Not every statement is both true and false" (Putnam 1983). The search for solid foundations for knowledge has undoubtedly failed, and this failure has cast some philosophers into the desperate postmodern conclusion that philosophy is dead and that nothing survives but discourse about discourse. Such despair is

unwarranted if one adopts a perspective that is coherentist and naturalistic.

Analytic philosophy and phenomenology attracted followers not only because they offered certainty, but also because they offered methods for making philosophical progress. Logical analysis and phenomenological reflection gave philosophers ways of pursuing foundational goals that sharply demarcated their methods from those of empirical psychologists. Along the way, acute philosophers in both traditions often made interesting and important observations about language, meaning, and life in general, although the results of the core methods of logical analysis and phenomenological reduction have been meager. In recent decades, however, naturalistic approaches have undergone a dramatic revival.

4 COGNITIVE NATURALISM

Naturalistic approaches to philosophy that tie it closely to empirical science are as old as philosophy itself. Precursors of contemporary naturalism include Thales, Aristotle, Bacon, Hume, Mill, Peirce, and countless others. Philosophical naturalists see philosophy as continuous with science in both subject matter and method, rejecting supernatural entities. Naturalism need not, however, reduce philosophy to empirical science, which is highly relevant to normative issues in logic, ethics, and aesthetics but does not fully suffice to settle those issues (see chapter 5).

What distinguishes the movement I call *cognitive naturalism* is its close ties with cognitive science, an interdisciplinary amalgam of psychology, artificial intelligence, neuroscience, and linguistics that originated in the mid 1950s (Gardner 1985). The central hypothesis of cognitive science is that thought can be understood in terms of

computational procedures on mental representations. This hypothesis has had enormous empirical success, providing explanations of numerous phenomena of human problem solving, learning, and language use. Although there is considerable dispute within cognitive science concerning what kinds of procedures and representations are most important for understanding mental phenomena, the computational/representational approach is common to current work on how mind can be understood in terms of rules, concepts, analogies, images, and neural networks (see Thagard 1996 for a concise survey).

Mirroring the diversity of approaches to cognitive science, philosophers within the cognitive-naturalist movement draw on different aspects of contemporary psychology, linguistics, artificial intelligence, and neuroscience. But the differences should not obscure the commonalities among philosophers who agree that many traditional philosophical problems are intimately tied with results in the cognitive sciences that have implications for issues in epistemology, metaphysics, and ethics (see, for example, P. S. Churchland 1986; P. M. Churchland 1995; Giere 1988; Goldman 1986; Harman 1986; May, Friedman, and Clark 1996).

Cognitive naturalism contrasts with philosophical approaches that predate the rise of the computational/representational view of mind. Quine is an influential twentieth-century naturalist whose epistemological views display the impact of behaviorist psychology, seen especially in his concern with observable stimuli. Quine's major work, *Word and Object*, was published in 1960 and was strongly influenced by his association with his behaviorist colleague B. F. Skinner, but it ignored the emerging approach of George Miller and Jerome Bruner, who were also at Harvard and who started the Center for Cognitive Studies in 1960. Quine's naturalistic epistemology is a behaviorist naturalism rather than a cognitive naturalism.

Another naturalistic movement in the twentieth century was the "scientific philosophy" of the logical positivists. However, its leaders, such as Carnap and Reichenbach, followed Frege in rejecting the relevance of empirical psychology to epistemological issues and in basing their theories on formal logic. If human thinking employed the apparatus of symbolic logic, then there would be little difference between logical naturalism and cognitive naturalism. But there is abundant evidence that thought requires mental representations such as concepts and images, and computational procedures such as spreading activation and pattern matching, that go beyond the kinds of structures and inference allowed in the logical framework. Frege would have said, so much the worse for psychology, but the failure of the logicist approach to epistemology does not permit such arrogance.

A third kind of naturalistic epistemology is found in the writings of sociologists such as Latour and Woolgar (1986), who claim to explain the development of science exclusively in terms of social relations such as power. Social naturalism, however, is compatible with cognitive naturalism if it more reasonably offers social explanations as complementary to cognitive explanations of science rather than as alternatives. Examples of how cognitive and social naturalism can be combined can be found in Goldman's (1992) discussion of epistemic standards for social practices, Bloor's (1992) acceptance of a cognitive background to social relations, and my own discussion of cognitive and social explanation schemas for scientific change (Thagard 1999).

Unlike the monolithic social naturalism of Latour and Woolgar, cognitive naturalism is nonexclusionary.

Applying the cognitive sciences to philosophical problems is completely compatible with also applying other sciences as appropriate. Metaphysical questions concerning space and time, for example, are more heavily tied with contemporary physics such as the general theory of relativity. Cognitive naturalism is compatible with physicalism, the thesis that all natural phenomena are physical, so long as it is recognized that physics is not the only science relevant to philosophical issues. In sum, cognitive naturalism is intended to supersede behavioral and logical naturalism, but it is compatible with nonexclusionary social and physical naturalisms.

This book is an extended exercise in cognitive naturalism, combining psychology and philosophy in ways that are intended to illuminate both fields. Philosophical ideas about coherence turn out to be highly relevant to understanding important psychological phenomena, while computational ideas greatly enrich understanding of coherence. Cognitive naturalism supersedes analytic philosophy and phenomenology and points the way to ongoing cooperation and coevolution of philosophy and psychology. This book pursues a cognitive-naturalist approach not only to epistemology (chaps. 3, 7) and metaphysics (chap. 4), but also ethics (chap. 5), political philosophy (chap. 5), and aesthetics (chap. 6). Let me emphasize that tying philosophy closely to the cognitive sciences does not mean the death of philosophy, because cognitive naturalism only enriches the philosophical enterprise in both content and method.

5 SUMMARY

Philosophy and psychology went their separate ways in the twentieth century, but the separation has been costly.

Cognitive naturalism is the rising approach to philosophy that finds close ties between philosophy and the cognitive sciences, including psychology, neuroscience, linguistics, and artificial intelligence. A computational approach to coherence has the potential to provide both a powerful theory of important cognitive mechanisms and a nonfoundational solution to philosophical problems about justification.