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THEO C. MEYERING

# HISTORICAL ROOTS OF COGNITIVE SCIENCE

The Rise of a Cognitive Theory of Perception  
from Antiquity to the Nineteenth Century

KLUWER ACADEMIC PUBLISHERS

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*“Als wesentlichsten Fortschritt der neueren Zeit glaube ich die Auflösung des Begriffs der Anschauung in die elementaren Vorgänge des Denkens betrachten zu müssen, die bei Kant noch fehlt, wodurch dann auch seine Auffassung der Axiome der Geometrie als transzendente Sätze bedingt ist. Es sind hier namentlich die physiologischen Untersuchungen über die Sinneswahrnehmungen gewesen, welche uns an die letzten elementaren Vorgänge des Erkennens hingeführt haben, die noch nicht in Worte fassbar, der Philosophie unbekannt und unzugänglich bleiben mussten, so lange diese nur die in der Sprache ihren Ausdruck findenden Erkenntnisse untersuchte.”* (Hermann von Helmholtz, ‘Die Tatsachen in der Wahrnehmung’, 1878).



*Daguerreotype showing Helmholtz as a young man at about the age of twenty, presumably around the time when he graduated from the medical school at Berlin in 1842, where his teacher Johannes Müller, the founding father of the rich research tradition in physiology in 19th century Germany, held the world's first 'Professorate in Physiology'.*



*Helmholtz shown again towards the end of his extraordinarily fertile and versatile career at the age of 60, this time as the renowned professor of physics, back again at the same Friedrich-Wilhelm Institute of Medicine and Surgery of the University of Berlin, where he had received his own education.*

## PREFACE

Cognitive science, in Howard Gardner's words, has a relatively short history but a very long past. While its short history has been the subject of quite a few studies published in recent years, the current book focuses instead on its very long past. It explores the emergence of the conceptual framework that was necessary to make the rise of modern cognitive science possible in the first place.

Over the long course of the history of the theory of perception and of cognition, various conceptual breakthroughs can be discerned that have contributed significantly to the conception of the mind as a physical symbol system with intricate representational capacities and unimaginably rich computational resources. In historical retrospect such conceptual transitions—seemingly sudden and unannounced—are typically foreshadowed in the course of enduring research programs that serve as slowly developing theoretical constraint structures gradually narrowing down the apparent solution space for the scientific problems at hand. Ultimately the fundamental problem is either resolved to the satisfaction of the majority of researchers in the area of investigation, or else—and much more commonly—one or more of the major theoretical constraints is abandoned or radically modified, giving way to entirely new theoretical vistas.

In the history of the theory of perception this process can be witnessed at various important junctures. In the first part of this book I have focused, in particular, on the Aristotelian identity theory of perception; on the Alhazenian synthesis in optical theory during the Arab and European Middle Ages; on the radical impact of seventeenth century mechanicism and the attendant dissociation of a representational psychology of visual perception from physiological and mathematical optics; on the rise, and the vicissitudes, of a Cartesian inspired computational theory of mind; on the rise of rival empiricist learning theories of perception during the 17th and 18th centuries; on the persistent philosophical bias in rationalist and empiricist circles alike which served to identify cognitive activity with conscious activity, thus hampering the development of a full-fledged empirical and experimental psychology; and, finally, on the rise of a truly information-theoretical conception of the mind in the seminal work of the nineteenth century mathematician, physicist, and (neuro-)physiologist Hermann von Helmholtz.

From this perspective it transpires that the history of the theory of perception is characterized by the gradual emergence of a cognitive theory of perception according to which perception involves information processing of an essentially interpretive character. The implied radically novel conception of the human mind on the one hand helped to define an entirely new research program in cognitive psychology, whose impact has become ever more keenly felt especially after its relatively recent coalescence with various breeds of computational theories of mind in computer science, psycholinguistics, neuroscience, and the philosophy of mind. On the other hand, it immediately raised acute epistemological problems as well. For given this theoretical perspective, perceptual knowledge is seen as essentially based upon *insufficient evidence*. Helmholtz was one of the first philosopher-scientists to perceive the epistemological problem in such terms, to pose the central question of how to reconcile a truly information-theoretical account of perception with a theory of objective perceptual truth, and to initiate a novel research program that would represent an important contribution to the solution of that query.

Helmholtz embodied the ideal of the *homo universalis*. An extraordinary polymath, his accomplishments ranged over many fields of study, from measurement theory to theoretical physics, from physiological optics to metamathematics, from epistemology to cognitive psychology. He thus worked ('unorthodoxly') on both sides of the fence which later (neo-kantian, logical positivist and analytic) philosophers deemed necessary to erect between philosophy and empirical science. Thus various promising Helmholtzian ideas were *a priori* ruled out of court by subsequent generations as 'rife with conceptual confusions'. This holds particularly true of Helmholtz's pioneering theory of unconscious inferences, which has been of such foundational importance for the conceptual framework of cognitive psychology as well as for that of cognitive science in general, but which even now tends to be passed off by some contemporary philosophers as 'a mythology of mental processes' and again—a very favorite verdict—as 'a tangle of conceptual confusions'.<sup>1</sup> It will be the main concern of the second part of this book to describe and evaluate Helmholtz's naturalism and his lasting contributions to both epistemology and cognitive psychology, as well as to discuss the relevant theoretical controversies in nineteenth century physiological optics Helmholtz was engaged in as a consequence of his philosophical point of view.

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<sup>1</sup> P.M.S. Hacker, 'Helmholtz's Theory of Perception: an Investigation into its Conceptual Framework', *forthcoming*.



Yet this study aspires to offer more than unadulterated intellectual historiography. In addition, I also hope to adduce positive arguments on behalf of the philosophical thesis inherent in naturalistic epistemology. The Kantian demarcation within the realm of legitimate knowledge between philosophy and empirical science is bound to prove detrimental to both, if it is taken to imply that philosophy is an independent discipline entitled to some ultimate verdict on the study of the structures of man's cognitive and perceptual faculties in virtue of the claim that philosophy alone enjoys privileged access to some special set of strictly *a priori* insights. To be sure, the distribution of intellectual tasks prescribed by Kant failed to prevent the rise of empirical psychology and of psychophysiology in the course of the nineteenth century. Nevertheless, the Kantian proclamation still reigns supreme among quite a few contemporary philosophers—albeit now in the guise of some updated version of analytic philosophy. Indeed, up to this very day many philosophers still adhere to the view that the mind-body problem is a strictly *conceptual* issue which can *only* be illuminated and resolved by philosophical analysis of the relevant concepts in ordinary discourse. The notion that ordinary language might itself contain a hidden, but all the more tenacious *theory* about the etiology of human behavior, and that therefore the apparently 'intuitive evidence' our linguistic habits seem to offer may at best *compete* in the arena of philosophical argument as a (relatively naïve) *rival interpretation*, but certainly not as the highest *arbiter* in matters psycho-philosophical, is an insight that has not yet dawned, it seems, upon the philosophical orthodoxy at large.

In contrast, the current study emphatically favors the non-Kantian, naturalistic view that philosophical and psychological questions are theoretically continuous with each other. They are, that is, mutually relevant and can only be resolved by a fruitful interaction between the respective disciplines. Consequently, it is to be expected that the rise and the radical development of experimental studies of cognitive faculties and their neurological substrata over the past one hundred years and especially during the post-war period, implicitly comprises quite specific consequences for the sophistication, adjustment, or rejection of current philosophies of mind. Conversely, philosophical considerations can in principle be expected to yield fruitful theoretical suggestions for the interpretation of experimental psychological research. Thus in modern cognitive science philosophical and experimental research tend to go hand in hand. In fact, cognitive science can be defined as a multidisciplinary effort with strong empirical overtones attempting to solve long-standing theoretical problems in the philosophy of mind and the theory of knowledge by building plausible information-processing models of how the mind 'ticks'. These models are subject to constraint structures in

which elements of the *entire* interdisciplinary field, whether conceptual, theoretical, or empirical, may serve as determining vectors depending on the degree of their presumed epistemological stability. Consequently, philosophical questions concerning the human mind can no longer be decided 'internally', on no other grounds than purely *a priori* considerations and with a total neglect of the results of relevant research within experimental psychology. On the contrary, just because philosophical presuppositions do play a role, explicitly or otherwise, in the determination of rival constraint structures in theoretical psychology, whose relative fertility must be proven in ongoing research, these basic philosophical assumptions, just as all other theoretical assumptions in empirical science, become accountable to empirical evidence as well.

In fact, the rational reconstruction of the history of the theory of perception as pursued in this book, at the same time itself represents an exercise in naturalistic epistemology. For the possibility of reconstructing—that is, of making true sense of—the histories of 'philosophical' epistemology and the 'empirical' theory of perception *in isolation from each other* is expressly denied. Rather it is shown that philosophical and empirical questions are directly and inextricably intertwined. Accordingly it is argued that epistemological questions can only be rendered intelligible at any given time relative to a comprehensive theoretical enterprise in which philosophical and empirical developments interact and are jointly relevant. The admittedly ambitious project embarked upon in the present book thus also expands the naturalistic thesis not by demonstrating its truth, but by showing its success if adopted as a research program for philosophico-historical inquiry. This in turn generates positive arguments on behalf of naturalism which instead of being purportedly derived from evident truths or *a priori* insights (a pitfall to be avoided at all cost as it would undermine the very proposition thus defended), would be derived solely from its illuminating force and its practical effectiveness as an instrument of historical analysis. Again, it is a plausible corollary of naturalistic epistemology that the history of so-called philosophical epistemology should itself be susceptible to successful analysis by means of historiographical models specifically designed in order to describe, or to account for, the development of *theoretical science*. A positive test of this consequence should thus count as a corroboration of the theoretical proposal inherent in epistemological naturalism.

Too much time has elapsed since the ideas expressed in this book first began to take shape, for me to distinctly remember the rather variegated philosophical influences that have helped to determine the eventual outcome of my work. I still feel immensely grateful to have benefited for so many years

from the American academic scene in general, and in particular from the very diverse intellectual attractions the Berkeley campus had to offer during the years of my graduate training there. Those were years of great intellectual excitement, due in the first place to the quality and the diversity of the philosophical Faculty at the time, and secondly to the flux of prominent scholars in various fields of study visiting this intellectual Mecca on the West Coast (and here I am not just referring to the likes of Professor Philip Swallow, immortalized by David Lodge). Thus I remember—not necessarily in order of vividness—the vigorous courses taught by John Searle; or Barry Stroud's exercises in historical and conceptual analysis; or the subtlety of Benson Mates, who combined dignity with an irrepressible sense of humor; Paul Grice's power of analytic thought; Charles Chihara's pungent style of argument; or Carl Hempel's acumen, open-mindedness and irresistible narrative charm—to mention but a few of the many precious recollections I still cherish of the intellectually stimulating ambiance Berkeley provided me during my stay.

However, my greatest intellectual debt, especially with regard to the present book, I owe without doubt to two of my former teachers of philosophy, Hans Sluga and Paul Feyerabend. Their appreciation, each in his own very distinct way, of the historical, cultural, and theoretical embeddings of philosophical enquiry, and indeed of the contextual nature of virtually all intellectual pursuit worthy of the name, has had a lasting influence on my own naturalistic inclinations 'in matters epistemological'. Feyerabend's seminars, conducted in a fashion which, to put it mildly, deviated considerably from conventional styles of formal instruction, always seemed to hold the promise of something like a true intellectual happening, breathing an air of novelty and of stunning surprise. A colorful debater, with a malicious style, taking unexpected turns and bewildering his audience with his imaginative ideas, he inspired as much as he provoked. To more rigorous minds perhaps no more than a frivolous source of countersuggestion, I am convinced that many of Feyerabend's critical ideas will stand as an enduring monument of mid-twentieth century philosophical innovation.

Feyerabend, of course, needs no praise. Nor is he very likely to relish it. For the anarchist, epistemological or otherwise, when eulogized with reverence and acclaim, usually suspects the impending advent of his gravest foe, general respectability. No wonder then, that the old master's scorn has always been more readily incited by applause than by criticism. So be it.

No less beneficial than Feyerabend's impact has been the influence of Hans Sluga's philosophical ideas. His critical assessment of analytic philosophy (right in 'The Bear's Lair', so to speak) generated new insights and methods

of philosophical understanding that were a welcome supplement to the prevailing methods of formal and conceptual analysis with which I had become abundantly acquainted during my former philosophical training (and which I still hold in due regard). While Feyerabend had emphasized that *science* can only be understood as a historical phenomenon, Sluga extended this insight to the nature of *philosophical* theory formation as well. Sluga's own scholarly work on Frege provides an excellent example of the wide range of new and valuable insights that can be gained once this post-analytical conception of philosophy is put to work in the concrete context of actual philosophico-historical enquiry. Clearly, his basic point of view has helped to shape the methodology of the present book and, in general, has left indelible marks on my own appreciation of the relation between philosophy and theoretical science, and of the ineradicably historical nature of both. In addition, I am also deeply grateful for the encouragement I received from Hans Sluga, who indefatigably spurred me on to go ahead and publish this book.

Furthermore, from among the many scholars referred to in the footnotes I owe a special debt of gratitude to the pioneering research of A.C. Crombie and to the meticulous historical studies of David C. Lindberg. Their extensive work, especially in the area of medieval and Renaissance theories of vision, has proved an invaluable asset to my own attempts at historical reconstruction.

I also wish to thank Richard Rorty for his insightful philosophical remarks and his valuable editorial comments, both of which I have tried to incorporate as well as I could.

Many friends and colleagues, in one stage or another, have obliged me with their encouragement, their helpful comments or their critical suggestions. In particular I wish to thank Diedel Kornet, Herman Philipse, and Françoise Wemelfelder of Leiden University; Gerard de Vries of the University of Limburg; Colin Brown of the Max Planck Institute for Psycholinguistics; Paul van Seters of Tilburg University; and my old Berkeley friend Martin van den Toorn.

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Theo C. Meyering  
Amsterdam, 1989

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