

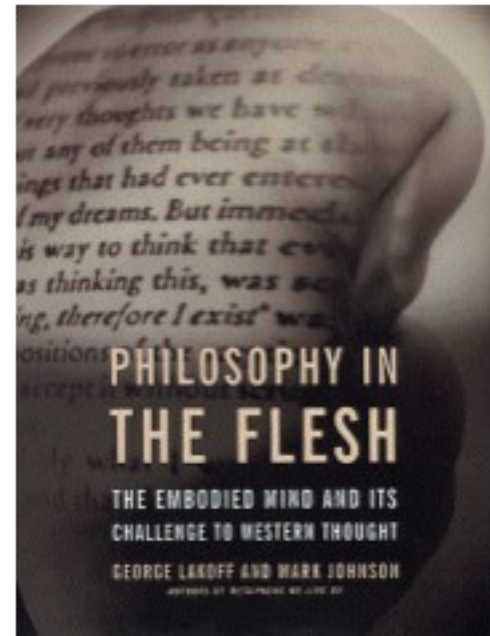
Review of *Philosophy in the Flesh: The embodied mind and its challenge to Western thought*

By George Lakoff and Mark Johnson
University of California, Berkeley, and University of Oregon

New York: Basic Books, 1999, xiv+624 pp.
Hardbound, ISBN 0-465-05673-3
Paperback, ISBN 0-465-05674-1

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This is a revised preprint of a review published in *Computational Linguistics*, vol. 25, no. 4, December 1999. The major addition is the section called Epilog, which adds some comments about more recent developments of the NTL project. It also includes a brief review of the earlier book by Johnson, *The Body in the Mind*, which presents a more detailed analysis of the philosophical issues about embodied minds.



The authors begin with three sentences that summarize and characterize their book:

The mind is inherently embodied.
Thought is mostly unconscious.
Abstract concepts are largely metaphorical.

Part I supports these sentences with findings from cognitive science “that human reason is a form of animal reason, a reason inextricably tied to our bodies and the peculiarities of our brains” and “that our bodies, brains, and interactions with our environment provide the mostly unconscious basis for our everyday metaphysics, that is, our sense of what is real.” The third sentence is a summary of their earlier work on metaphor (Lakoff and Johnson 1980), which in Part II of this book they extend to a more detailed analysis of the metaphors underlying basic philosophical issues, such as time, events and causes, mind, self, and morality. Part III applies that analysis to the metaphors tacitly assumed by philosophers ranging from the Presocratics to Noam Chomsky. Part IV presents arguments for “empirically responsible philosophy” and its potential for understanding “who we are, how we experience our world, and how we ought to live.” Finally, the appendix summarizes research inspired by this philosophy that has produced computational simulations of certain aspects of embodied minds.

Given such a broad scope, the authors have not been able to cover all the topics with equal success. Instead of challenging all of western philosophy, they should have concentrated on their major opponent, Noam Chomsky and his philosophy of language. Lakoff began his career in linguistics as a student and later a teacher of Chomsky’s version of transformational grammar. But in the late 1960s, he joined with other former students to promote generative semantics as an alternative to Chomsky’s generative syntax. The result was a series of “linguistic wars,” whose history has been retold by various participants over the past twenty years. Chapter 22 of this book presents a strong case against Chomsky’s “autonomous syntax” and for an approach that bases syntax on semantics and semantics on the bodily mechanisms of perception and action.

The philosophical and linguistic arguments of Chapter 22 are reinforced in the appendix by a summary of the *Neural Theory of Language* (NTL), which is being developed by Jerome Feldman, George Lakoff, Lokendra Shastri, and their students. To date, the NTL group has undertaken three major tasks in language understanding and learning:

1. For his dissertation on learning spatial relations, Terry Regier (1996) started with the cross-linguistic analyses of spatial relations by Len Talmy (1983). Regier failed in his first attempts to get a conventional PDP (parallel distributed processing) network to learn spatial relations, such as *above* and *in*. He later developed a hybrid system with a simulation of human perceptual mechanisms as a front-end to a PDP network for learning.
2. For learning verbs of hand motion, David Bailey (1997) started with Jack, a computer simulation of the muscles and joints of the human body. To represent motor schemas, Bailey collaborated with another student, Sriniv Narayanan, to adapt Petri nets to represent the real-time control of hand motions. Then Bailey used a PDP network to learn which combinations of Jack's motions were associated with verbs in English, Farsi, Russian, and Hebrew.
3. For motor control and abstract aspectual reasoning, Narayanan (1997) discovered systematic patterns of Petri nets that could be tailored to represent most, if not all bodily movements. Those patterns correspond to the aspectual features of verbs, which have long been studied by linguists. Then Narayanan showed how the same patterns used to interpret Jack's bodily motions could be used to interpret metaphors, such as *France falls into a recession, Germany pulls it out, and India releases the stranglehold on business*.

By showing the importance of the human motor and perceptual mechanisms for language understanding, these studies give concrete meaning to the catchphrase *embodied mind*. The "neural" metaphor, however, is not entirely justified, since the computational mechanisms that support these systems are mostly classical. Jack incorporates standard computational simulations, Petri nets are a distributed processing model commonly used to simulate multithreaded operating systems, and PDP networks are statistical computing systems that have only a remote resemblance to actual neurons. A more appropriate acronym might be VRTL, for Virtual Reality Theory of Language.

For the other philosophers discussed in Part III, the treatment is often brief to the point of dangerous overgeneralization. Whereas the authors devote 44 pages to Chomsky, they cover all of "Anglo-American analytic philosophy" in 29 pages, while lumping together Frege, Russell, Carnap and the Vienna Circle, Quine, Goodman, Davidson, Putnam, Kripke, Montague, and Lewis. In the same chapter, they continue with ordinary language philosophy (Strawson, Austin, and the later Wittgenstein), which they consider to be based on the same metaphors. Yet these philosophers have expressed widely divergent views on the embodiment of mind, the nature of language, and Chomsky's theory of autonomous syntax. By drawing finer distinctions, the authors might have claimed some of them as potential allies against Chomsky's position.

For the classical philosophers, the authors use their terminology of metaphors and folk theories to make a rather conventional commentary seem novel. Plato, they claim, "had the metaphor *Essences As Ideas*, Aristotle has the converse metaphor, *Ideas Are Essences*." No philosopher who hopes to be "empirically responsible" should make such statements without much deeper analysis of how those metaphors relate to the words that Plato and Aristotle actually used. In their discussion of Aristotle's theory of causation, they fail to distinguish Aristotle's notion of *aition* and the Latin translation *causa* from the modern English word *cause*, which has undergone profound shifts of meaning in Newton's mechanics, Hume's philosophy, and more recent theories of relativity and quantum mechanics. They also apply the same term *formal logic* to Aristotle's syllogisms and to all the modern logicians despite the widely divergent opinions that the modern logicians have expressed about Aristotle and about each

other.

A glaring omission in a book on embodied minds that discusses Aristotle is the failure to mention his theory of the *psyche*, which is the earliest and one of the best characterizations of the embodied mind. Aristotle defined the psyche as the *logos* or principle that determines what it is for something to be a living entity. Instead of a single principle of the psyche that covers all living things, Aristotle defined a hierarchy of six functions, each of which is a prerequisite for all the rest: nutrition, perception, desire, locomotion, imagery, and reason. He maintained that plants have a psyche that is limited to the nutritive function, sponges to the first three functions, worms to the first four, and the higher nonhuman animals to the first five. In having reason, the human psyche requires all the others as prerequisites. Aristotle's theory is consistent with Lakoff and Johnson's criterion for a theory of embodied mind: "There is no such fully autonomous faculty of reason separate from and independent of bodily capacities such as perception and movement. The evidence supports, instead, an evolutionary view, in which reason uses and grows out of bodily capacities." (p. 17)

Aristotle's hierarchy bears a striking resemblance to the levels of competence that Rodney Brooks (1986) defined for mobile robots: avoiding, wandering, exploring, mapping, noticing, reasoning, planning, and anticipating. Since all of Brooks's robots have locomotion, Aristotle's theory predicts that they must also have nutrition (the ability to recharge their batteries), perception (at least at the level of touch), and desire (a preference that determines goals). The first four functions are sufficient to support the competence levels of avoiding, wandering, and exploring. Imagery is necessary to support mapping and noticing, and thought is necessary to support reasoning, planning, and anticipating. The lower levels of Aristotle's hierarchy, which he applied to sponges and clams, could support sedentary agents, such as thermostats and alarm clocks.

The most irritating feature of the book is the authors' repeated claims of novelty, either for themselves or for their colleagues. A typical example is the following paragraph from page 10:

Cognitive science is the scientific discipline that studies conceptual systems. It is a relatively new discipline, having been founded in the 1970s. Yet in a short time it has made startling discoveries. It has discovered, first of all, that most of our thought is unconscious, not in the Freudian sense of being repressed, but in the sense that it operates beneath the level of cognitive awareness, inaccessible to consciousness and operating too quickly to be focused on.

By dismissing Freud's theory of the unconscious as irrelevant, the authors try to make the recent work sound more "startling." Yet the literature contains well-documented examples of prior art. Among the best is William James's two-volume textbook *The Principles of Psychology*, which, in 1890, devoted many pages to the processes that operate beneath the level of cognitive awareness. James supported his presentation with explicit citations of experimental evidence, including reaction-time studies. On the cover of the 1965 reprint, one of the reviewers remarked "Rereading James brings a sense of perspective and even a little humility to our regard for more modern achievements."

In summary, this book makes an important contribution to the ongoing debates about the roles of syntax, semantics, and world knowledge in language understanding and their dependency on the physical world and the human mechanisms for perceiving, interpreting, and interacting with the world. Its major weakness is its tendency to exclude other perspectives, such as Aristotle's, which can accommodate both formal logic and a theory of embodied mind. Although the authors frequently use the word *neural*, none of their discussion depends on the actual structure or method of operation of a neuron. NTL could with equal justification be considered an acronym for a Neoaristotelian Theory of Language.

Epilog

In the years since Lakoff and Johnson published their book, the field of neuroscience has added more support for its basic conclusions. In a recent lecture, Lakoff summarized the first chapter of a forthcoming book with more detail about the neural aspects of NTL: <http://www.youtube.com/watch?v=XWYaoAojdQ>. I recommend this lecture and a book by Lakoff's colleague, Jerome Feldman (2006), who presents related developments. I partly agree with Feldman's summary (p. xiv):

While we are far from having a complete neural theory of language, enormous scientific advances have occurred in all the relevant fields. Taken together, these developments provide a framework in which everything we know fits together nicely... The book can be seen as part of a general effort to construct a Unified Cognitive Science that can guide our brains and minds.

But I would qualify the words *unified* and *nicely*. In a review of AI systems, Minsky (1991) surveyed the contributions of the many different and often competing paradigms. He claimed that the goal of a homogeneous system based on one ideal paradigm is too narrow to support the full range of human intelligence:

The functions performed by the brain are the products of the work of thousands of different, specialized sub-systems, the intricate product of hundreds of millions of years of biological evolution. We cannot hope to understand such an organization by emulating the techniques of those particle physicists who search for the simplest possible unifying conceptions. Constructing a mind is simply a different kind of problem — of how to synthesize organizational systems that can support a large enough diversity of different schemes, yet enable them to work together to exploit one another's abilities.

In short, the methods of Lakoff, Johnson, and Feldman provide a better explanation of the way language works than an amalgam of Chomsky's syntax with symbolic logic. If the word *unified* is interpreted as a call for more collaboration among cognitive scientists, I strongly agree. But Minsky's arguments are persuasive: the human brain is far too flexible to be nicely explained by a single, unified paradigm. Instead of the goals that inspire physicists, Minsky recommends biology. The overwhelming diversity of organisms from the smallest to the largest is far greater than anything the physicists have imagined. DNA is the foundation for all of them, but it encodes information of far greater complexity than any computer program ever conceived. For a theory of the embodied mind, biology is a better guide than physics.

Although I believe that the mind is embodied, I disagree with the claim that NTL is incompatible with western philosophy. In an earlier book on the embodied mind, Johnson (1987) presented a more nuanced view. The real incompatibility is with two aspects of Descartes's philosophy: a God's-eye view of objective reality and a sharp dichotomy of mind and body. Johnson cited the model-theoretic semantics by Kripke and Montague as a definition of meaning that only an omniscient God could use. In his book *Cartesian Linguistics*, Chomsky (1966) acknowledged the influence of Descartes. Chomsky's dichotomy of competence and performance is as misleading as Descartes's mind-body puzzle.

In Chapter 6, "Toward a theory of imagination," Johnson analyzed the Western tradition, starting with Plato and Aristotle. In the Platonic view, imagination is creative, but suspect because of the distortions by poets who "feed and water the passions." In the Aristotelian view, imagination is "the faculty that mediates between sensation and thought. It is dependent on the former and makes possible the latter." This chapter includes a ten-page summary of Kant's theory of the *schema* as "a figure or outline in imagination that can be filled in by particular images or percepts." In the final chapters, Johnson

relates the embodied mind to Putnam's realism and Searle's writings on intentionality. But the introduction summarizes the central issues (p. xxxviii):

To sum up: as animals we have bodies connected to the natural world, such that our consciousness and rationality are tied to our bodily orientations and interactions in and with the environment. Our embodiment is essential to who we are, to what meaning is, and to our ability to draw rational inferences and to be creative. My phenomenological description... is a start on a project that would seek to fill in the gaps created by all those theories whose rigid dichotomies force them to compartmentalize and fragment life, and to ignore the centrality and indispensability of embodied imagination in life and thought.

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- For further information and publications by the NTL group at Berkeley, see [the NTL web site](#).