

# Book Reviews

## An Ancient Conundrum

**The Self and Its Brain.** KARL R. POPPER and JOHN C. ECCLES. Springer-Verlag, New York, 1977. xvi, 600 pp., illus. \$17.90.

Written by two retired eminent scholars, one a philosopher and the other a physiologist, this volume offers yet another metaphysical solution to the ancient body-mind problem. It is important not because of anything new that it says but because of the conflict it reveals and enlarges on—the conflict between a belief in a self-actuating, indeterminate human soul and the possibilities of a scientific understanding of human neurophysiology and mental life. The possibility of a theory of mind hides behind the book's ambivalences and ignorances, as well as behind the history of the conundrum. How to explain the relation between the human brain and body and the "self-evident" free and incorporeal human mind?

Popper, in the first part of the book, denies a belief in the animistic soul, but resurrects it in the image of the self that directs the brain. Eccles, in the second part, hopes to see the immortal soul arise from the incompleteness of modern neurophysiology. Both repeat the ancient and artificial conundrums, one from ancient mentalism, the other from traditional physiology. Neither comes to grips with the emerging 20th-century position (from psychology, linguistics, the neurosciences, and artificial intelligence) that seeks to explore constructed theories of the brain and of the mind and the relations between them. The final part of the book, a repetitive and stylized dialogue between the authors, approaches, in a coda of historical problems, some questions about the structure of the mind that can be read as prolegomena to a mental theory. The book is important as a reminder of our history, as well as a curtain raiser to a period that is already well under way.

Popper's part of the book is by far the more interesting. He uses his extensive logical skills elegantly to review both the substance and the development of an important slice of our intellectual history. In particular I found it useful to be reminded that body-mind dualism is far older than Descartes and that it was Des-

cartes's insistence on a particular model of materialism that made his contribution more visible and important than those of his predecessors.

Popper first rejects materialism in general, partly on grounds of its denial of consciousness, partly because of its inability to handle (that is, reduce) arguments based on logical principles. However, en passant he also shows that the older push-pull doctrines of materialism have been displaced by both the substance and the structure of modern physics. He rejects epiphenomenalism (the view that mind is an ineffectual by-product of the body) on the best available grounds, namely that it does not give consciousness any biological function or handle its emergence or evolution satisfactorily. Similarly he rejects identity theory (which regards mental processes as identical with certain brain processes) on the same evolutionary grounds, as well as on the basis of its difficulty with the concept of "identity." Parallelism and identity theory (and Popper convincingly calls the latter a special case of the former) assert the "reality" of mental phenomena but see mind and body as noninteracting entities existing side by side. Popper rejects both, principally because they fly in the face of established Darwinian wisdom, and secondarily because they cannot handle strong empirical evidence from perception, action, and visual illusions that favors (from his point of view) directive active minds that "use" the neural mechanisms of the brain. While many of these arguments are not new (not even with Popper), they are well presented and, in the best sense, thought-provoking. Throughout these discussions Popper defends his own interactionist point of view, freed from Descartes's simplistic principles of causation. In particular, Popper relates interactionism—the causal, interactive relation between real bodies and real minds—to his tripartite view of the world: World 1, the world of physical objects; World 2, the world of experience and consciousness; and World 3, the world of human products, of knowledge, culture, and theory.

One puzzling result of the ambivalence that crowds the book is Popper's treatment of reductionism. Early on he re-

jects the reductionist thesis that the theories and data of the social and biological sciences should be reducible to those of the chemical and physical sciences. Such a reduction seems to be ruled out, whether in principle or in practice. However, Popper accepts the materialist question of how mental phenomena are to be reduced to "merely" physical ones. If one asserts that biochemistry is not reducible to nuclear physics then surely one must assert that properly constructed and validated theories of mental events are not reducible either.

Where Popper is careful about the conjectural, theoretical, and hypothetical nature of his notions, Eccles seems to have no such reservations. He accepts one particular version of the mind (the self-conscious mind) as given and proceeds to do very little about it. His section is mainly one neurophysiologist's introduction to the structure and function of the brain. The more recent work on hemispheric specialization and commissurotomy is discussed at length primarily in order to ascribe to the dominant (usually left) hemisphere most of the function of interacting with the self-conscious mind. Given the admittedly important role of the right hemisphere in mental activity, such a statement is best left unexamined, as is a concluding chapter where the brain and the mind are brought together. It is the first instance, to my knowledge, where the all-powerful mental homunculus has been introduced into a flow diagram, together with all the requisite arrows going hither and yon.

One of the foci of the entire volume is its third participant: the homunculus. After wondering what the mind that is so often discussed might be (it is consciousness, it is attention, it is soul, it is self, it is the self-conscious mind) one finds that it turns out to be independent, active, selective, it makes decisions about where to direct attention, what to remember, it directs the body, and it protects it from harm. Thus, inside the body there sits a fully formed intellectual guide, a homunculus, who does all the things that are interesting about human action and experience. We are right where we started; the next book will have to be about the theory of the homunculus.

While Popper insists on a theory of matter and brain to represent the "body," he only hints at a theory of mind, and just as often he backs away from it. However, he does ask interesting questions about mental functions as the constructors of experience and about their ontogeny and phylogeny.

Many of the questions about memory that seem puzzling to Popper and Eccles have been asked (and some answered); many of the questions about the growth of knowledge and the structure and function of language have been explored, as have many of the mechanisms of the self-conscious mind that Popper and Eccles assign to the homunculus. These assignments occur usually when the authors fail to find a physiological mechanism that will serve the purpose. However, alternative mechanisms are alive and well in psychology, linguistics, and the cognitive sciences in general. It is embarrassing that a philosopher of the mind and a physiologist of the brain can be functional illiterates in the disciplines about whose subject they speculate.

It is not the case, as Eccles asserts in a particularly painful bit of nonsense, that recognition memory consists of the retrieval by the brain of candidate events, which are then accepted or rejected as "correct" or "incorrect" by the mind (which, if it had the knowledge, would not need the brain). It is certainly not the case both that the "first product of the human mind is human language" (p. 11) and that "language, once created, exerted the selection pressure under which emerged the human brain and the consciousness of the self" (p. 13). It is not the case that computer models cannot simulate the brain "whose function is not primarily to compute but to guide and balance an organism and help it to stay alive." It is not the case, as Popper asserts, that the only possible theoretical comprehension of mental events would have to come from a theory of the mind that he properly rejects, associationism.

Modern conceptions of the mind include those theoretical processes and mechanisms that are ascribed to human beings in order that their behavior, actions, and experiences may be understood. In contrast to traditional mentalism, and the authors' frequent implication, these mechanisms are largely unconscious and not available as "contents of consciousness." As Karl Lashley noted many years ago, consciousness primarily contains the products, not the processes, of thought. Current mental theories, which can accommodate problems of human memory much better than Popper's and Eccles's conjectures, have long abandoned associationism. Others inquire about the structure and origins of language, giving us knowledge far beyond that obtainable from brain preparations. Most practitioners of the fledgling science of artificial intelligence would consider the simulation of guid-

ing, balancing, and raw survival relatively simple compared to the problems about the structure of knowledge that they are currently tackling.

I have selected some very few examples of the authors' innocence of current work; the book is strewn with many more. The references to psychological work are either out of date or obtained by hearsay (or even, in one case, by hearsay of hearsay of hearsay). Both authors directly or indirectly admit their ignorance or avoidance of modern psychological literature. What a fine book this might have been if they had done their homework.

Finally, if we admit the construction of mental theories, and if we accept Popper's dictum against reductionism, where is the problem? Theories of mind and theories of the brain can coexist; eventually we will be ready to make statements coordinating the two. In the meantime the world is full of theories and experiments bearing on attention, memory, consciousness, the self-concept, the bases of intelligent behavior, and knowledge. Once we know that the "body" and the "mind" are constructed human products, we can reject both Descartes's artificial dualism and the Popper-Eccles vague, backward-looking nostalgia for the human soul. Read the book and find what fascinating problems are still left, but remember that many of them are well on their way to some temporary solutions.

GEORGE MANDLER

*Center for Human Information Processing, University of California at San Diego, La Jolla 92093*

## Brain Structure and Function

**Architectonics of the Cerebral Cortex.** Papers from a symposium, Vienna, Austria. MARY A. B. BRAZIER and HELLMUTH PETSCHKE, Eds. Raven, New York, 1977. xvi, 486 pp., illus. \$37.50. International Brain Research Organization Monograph Series, vol. 3.

The International Brain Research Organization has over the past few years mounted a series of symposia on different aspects of basic and clinical neuroscience. These in turn are generating a series of volumes, of rather mixed quality. The present volume is the third in the series and to date probably the most generally useful. The symposium on which it is based was held in Vienna in 1976 to mark the 100th anniversary of the birth of the Rumanian-born neuropathologist

Constantin von Economo, who received his early training and did most of his work at the University of Vienna. Von Economo's contributions to neuropathology and cortical cytoarchitecture, including his widely cited monograph (with G. Koskinas) *The Cytoarchitectonics of the Human Cerebral Cortex*, are briefly reviewed by Lesky, of the Institute of the History of Medicine in Vienna, and are set in a more general historical context by Brazier.

These historical chapters are followed by a number of chapters dealing with the morphology of specific cortical cell types. As is often the case with symposium volumes, much of the work discussed in these chapters has appeared in original form elsewhere. This is true also of Szentágothai's excellent discussion of specificity and randomness in cortical connectivity, in which he elaborates on his concept of the modular construction of the cortex. The remaining chapters on morphology are in general less substantial and are concerned with less basic issues. A great deal of effort has obviously gone into the studies dealing with the distribution of lipofuchsin in cortical neurons, the grouping of cortical dendrites in bundles, and the changing distributions of certain enzymes during cortical maturation, but it is difficult at this stage to relate them meaningfully to most other aspects of cortical structure or function.

Rather more than half the book deals with different aspects of electrocortical activity during normal behavior and during pathological or experimentally induced seizures. Again, little of the material is new, and one suspects that much of the phenomenology that is reported is not likely to stand the test of time. However, it is convenient to have some of it brought together and presented within reasonable compass; this is especially true of the contributions from Eastern Europe, some of which are otherwise difficult to obtain. Although some of these later chapters are likely to be of interest to clinical electroencephalographers, they will probably not arouse much interest among neurophysiologists. This is disappointing in view of the exciting recent developments in cortical physiology. It is rather surprising that in a volume concerned with cortical function there is so little reference to the recent electrophysiological studies of columnar organization in the cortex, or to the work on the response characteristics of neurons in conscious, behaving animals, or to that on the striking effects of selective sensory deprivation. But it is