

Review

Reviewed Work(s): *The Astonishing Hypothesis: The Scientific Search for the Soul.* by Francis Crick

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dergraduate learning, and even the tenure system, however, seemed to assume the existence of benign and trustworthy administrative structures that, in reality, are not universal. Peters champions the view that the inevitable restriction of federal grants in research will provide university professors with their most cherished resource: time to understand the scientific problem and to study it in peace. That worthy goal ignores the reality that too many businessmen in lab coats now pass for professors, and that the appetites of our research universities for indirect cost revenues have dictated the aspirations, expectations, and behavior of junior faculty and students for nearly a generation. Peters argues for an internal revolution to restore scholarship over grantsmanship as the motive force in faculties, and thereby to redeem the soul of the modern university. Each of us who recognizes the need for remedy ought to read this book, and then think about it.

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## NEURAL SCIENCES

THE ASTONISHING HYPOTHESIS: THE SCIENTIFIC SEARCH FOR THE SOUL. *A Touchstone Book.*

By Francis Crick. Simon & Schuster, New York. \$14.00 (paper). xiv + 317 p.; ill.; index. ISBN: 0-684-80158-2. 1994.

The general reader will be surprised to find Crick apparently addressing the problem of the immortal human soul. The idea of a soul is itself an astonishing hypothesis, which has given much employment to philosophers and clerics of all stripes, but Crick ignores this massive literature as irrelevant. His Astonishing Hypothesis is something quite different: it is that we can now tackle the soul problem experimentally. Many members of his own trade will submit that there is no such problem for they will have understood, as he has not, that materialist Darwinian natural selection eliminated not just the celestial Watchmaker but also our conceit that we are special and, for that reason, have a soul. It soon becomes clear that Crick's concern is really with consciousness, and that this book summarizes his thinking about "the problem of the brain."

Like most students of the brain, Crick accepts the mind-brain conjunction, but he is not prepared to accept the usual computer models. The brain is not a "black box"; it is a complex of organized neurons, and his passion is to understand the architecture of their arrangements. The approach has

to be empirical, to survey what we know, since we cannot even define what we mean by consciousness. The subject he chooses to study is seeing, because vision is what we know most about. Even in the end he makes no assessment of the merits of this choice, though others may find it untimely. Undergraduates taking Vision courses will use this book as a manual; but general readers will find that the going gets tough as the study advances. They will be amused and enlightened by the material on optical illusions, however, and should be able to follow the chapters on the physiology of vision, attention and memory. This is textbook stuff, refreshingly and clearly presented. The conclusion is that to be conscious of what we see we need an explicit, multilevel, symbolic interpretation of what is before our eyes. A homunculus (substitute for soul?) in our brain might, but will not, do. The trick is performed exclusively by neurons. At the end of the book Crick still hankers after his homunculus, and that sums up the frustration of his study.

We have now to examine the organization of neurons, first in a scrappy and poorly illustrated chapter on the Brain and then in a well-illustrated and precise chapter on the Neuron, getting down to cytology, transmitters, spikes and all the rest. From there we go to the visual cortex of primates, and if the lay readers are still with us they would do well to jump to Fig. 52, which lays out the semihierarchical organization of neurons from retina to hippocampus. Readers will be suitably impressed by the complexity of our vision system, and may wonder why there is nothing about its development or comparative anatomy to help us to understand why it has become so intricate. Brain damage throws some light on the possible roles of some regions, but like scans and squids, which look at the brain from outside, the approach is too crude to tell much.

Crick then showers forth a multitude of possible (and impossible) experiments to encourage others. His objective, and that of his collaborator Christof Koch, is to persuade brain scientists that now is the time to take the problem of consciousness seriously. I doubt if many will follow the lesson of "Dr Crick's Morning Service," and do that. Someone may be stimulated, though, to pursue a similar programme for a simpler sense, say, smell. But they will learn from this book that they need a better defined approach and objective than Crick started with.

There is a "Postscript on Free Will." 'Nuff sed, you may think. But no. Here Crick deduces, very tentatively, that the anterior cingulate sulcus is the brain locus of the operations that we identify as free will. If consciousness is only an (unnecessary)

abstraction from our self-consciousness, it seems possible that the latter may reside in the same place. Crick would then have come closer to his objective than he seems to realize. We shall see.

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HIV, AIDS, AND THE BRAIN. *Research Publications: Association for Research in Nervous and Mental Disease, Volume 72.*

*Edited by Richard W. Price and Samuel W. Perry III. Raven Press, New York. \$99.00. xvii + 334 p.; ill.; index. ISBN: 0-7817-0063-9. 1994.*

The Association for Research in Nervous and Mental Disease has maintained a virtually unbroken string of broad-ranging, high-quality annual publications since 1920. The current volume represents the proceedings from their December 1992 meeting on the dementia complex and analogous degenerative disease of the peripheral nervous system in HIV infection. The contributors are the most prestigious basic scientists and clinical investigators in this difficult area, including not only neurologists and psychiatrists but also those with expertise in the relevant virology and cell biology who, at the meeting, set the stage for subsequent discussions of HIV-1 neuropathology. The loss of developmental milestones in pediatric AIDS is covered in its own chapter and also within others. Infection of macaques with simian immunodeficiency virus, inasmuch as it serves as a model for AIDS encephalopathy, is also featured.

The quality of the contributions overall is good to excellent, although somewhat uneven. Many of the chapters represent the most scholarly analysis of currently available data. Chapters by Oldstone, on the role of cytotoxic T lymphocytes in the CNS; by Masliah and coworkers, on potential agents of the neurotoxicity induced by HIV-1; and by Griffin et al. on peripheral nerve disorders, stand out as particularly thoughtful and provocative. A few were either extremely speculative (and too long), or more superficial. Descriptions of the neuropathology were not helped by photomicrographs which were reproduced in black-and-white with indifferent success.

Editorially the book fell a little short — acronyms should have been standardized from one chapter to another, and some of the repetition might have been handled differently. Ultimately, the book is a little dissatisfying. This is less because of the contributions and what they have to say, than for the lack of progress in understanding and treating such a widespread cause of morbidity in HIV-1 infection. It is clear that tissue degeneration in AIDS dementia is more extensive than the number

of infected cells should warrant. Yet, the same questions arise repeatedly: What are the neurotoxic effects of cellular contact with HIV-1 envelope protein? Do metabolites of tryptophan, such as quinolinic acid, have a role? Are tumor necrosis factor and related cytokines also bad actors? These questions have been asked for several years now, and one senses the frustration that we still do not have answers that are at all helpful to patients.

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THE METABOTROPIC GLUTAMATE RECEPTORS.

*Edited by P. Jeffrey Conn and Jitendra Patel; Series Editor: David B. Bylund. Humana Press, Totowa (New Jersey). \$99.50. x + 277 p.; ill.; index. ISBN: 0-89603-291-4. 1994.*

Glutamate is the dominant excitatory neurotransmitter of the central nervous system, with a well-characterized role in fast synaptic transmission mediated through ionotropic receptors (e.g., NMDA, AMPA and kainate) that gate ion channels. The study of such well-behaved receptors having a rapid onset and offset of activation used to be a simple joy compared to classical neuromodulators, with their insidious and complex second messenger involvement, but it isn't that simple anymore. Glutamate has an emerging neuromodulatory role through metabotropic glutamate receptors (mGluRs) linked to a variety of G protein-coupled second messenger pathways. There can be mixes of ionotropic and metabotropic effects at both pre- and postsynaptic locations, a witch's brew of excitatory and inhibitory influences that confers an enigmatic face to once familiar glutamatergic synapses.

*The Metabotropic Glutamate Receptors* brings together some of the leading researchers in the field to provide an illuminating review of the essentials of mGluR molecular biology, receptor pharmacology, second messenger involvement, electrophysiology, behavioral effects and developmental plasticity. The book presents evidence of a wide and heterogeneous distribution of mGluRs throughout the central nervous system, effectively making the case that mGluRs are a pervasive and formidable influence. The description of the involvement of mGluRs in long-term potentiation and long-term depression at a variety of sites in the central nervous system should also be of wide interest.

As is almost inevitable with a multi-author volume treating a relatively new research area, there is some redundancy in the description of early work on mGluRs that is of minor distraction. Another potential difficulty with a review treating a fast moving field is the tendency for it to become quickly outdated. Indeed, our knowledge of the