

Review of *The Astonishing Hypothesis: The Scientific Search For The Soul* by Francis Crick

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Received: August 3, 1995; Accepted: August 13, 1995; Published: October 25, 1995

PSYCHE, 2(18), July 1995

<http://psyche.cs.monash.edu.au/v2/psyche-2-18-webster.html>

KEYWORDS: Francis Crick, binding problem, mind-brain problem, reductionism.

REVIEW OF: Francis Crick (1994) *The Astonishing Hypothesis: The Scientific Search for the Soul*. New York: Charles Scribner's Sons. xiv+317pp. Price: \$US 12.60 pbk. ISBN:0684801582.

1.1 This book is a challenging attempt to give a reductionist model of mental processes by one of the leading biologists in the world, Francis Crick. It is not surprising that the Noble laureate who discovered the reductionist explanation of DNA should extend this method to the mind-brain problem.

The Astonishing Hypothesis is that "You," your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll's Alice might have phrased: "You're nothing but a pack of neurons." This hypothesis is so alien to the ideas of most people today that it can truly be called astonishing. (p. 3)

1.2 Richard Gregory, a leading visual psychologist, has argued that Crick is outside of his own field here and could be regarded as a "loose cannon" in the field of visual consciousness, and yet Crick's book is both informative and well written. Crick's main goal is to find a neural mechanism that will explain consciousness, particularly in the context of visual awareness.

1.3 Crick's astonishing hypothesis about consciousness has four main ingredients:

1. In what Crick calls his Processing Postulate, he argues that each level of visual processing is coordinated by a single thalamic region, thus making the thalamus a key player in consciousness (p. 249).
2. Consciousness and short term memory need the activity of reverbratory circuits to maintain them.
3. In the case of the primary visual cortex (V1) there are 5 to 10 times more fibres going back to the thalamus from layer 6 of the cortex than those coming to the entire visual cortex from the thalamus. Crick argues that it is these interconnections which provide the basis for the reverbratory circuits.
4. Awareness requires the activity of the various cortical areas as well as the thalamus, which raises a problem in that the major visual area of the thalamus (the Lateral Geniculate Body) projects almost solely to V1. Thus if layer 6 is so vital to consciousness in its interactions with the thalamus, where do the layer 6's of higher visual areas, such as V4 and V5, do their interacting with the thalamus? Crick suggests that the Pulvinar nucleus might be a site but the evidence indicates that its projections to higher areas are not strong.

Crick cheerfully admits that the evidence is not strong for his proposal, but claims that it might provide new guidelines for future research.

1.4 A large part of the book is taken up by reviews of the psychology and the physiology of vision in humans and in primates. These reviews are interesting even though they are slanted towards the hypothesis. There are also chapters on the structures of neurons and brains and on the effects of brain damage on consciousness and visual awareness. Another chapter looks critically at more recent methods of studying the brain, such as the scanning techniques of MRI, PET and CAT. Other recently developed techniques, such as patch clamping for studying ion channels, are given briefer treatment. There is also a chapter on connectionism and neural networks. Overall these reviews are quite interesting--after allowing for Crick's particular point of view.

1.5 Crick raises the important problem of *binding*: because any object will have a host of different features (form, colour, motion, etc.) which could be processed in different visual areas, there clearly is a major problem in coming to understand just how the brain "binds" the activity of all these different neurons together to produce a coherent visual perception. Crick suggests that the coherent oscillations of neurons found across the cortex might be the binding mechanism, but admits that "on balance it is hard to believe that our vivid picture of the world really depends entirely on the activities of neurons that are so noisy and so difficult to observe" (p. 246). He then cautions that there may be several forms of visual awareness and consciousness. In fact, in a recent paper with Christoph Koch (Crick and Koch, 1995) they raise the question of whether we are aware of neural activity in V1. This hypothesis is very difficult to integrate with the above thalamic theory of attention and awareness. Crick also notes that there is a binding problem across different sense modalities.

1.6 One of the interesting features of this book is Crick's refusal to discuss any philosophical approach to consciousness apart from the eliminative materialism of Patricia and Paul Churchland. In a section on suggested further readings on the mind-body problem he cites only Searle, the Churchlands and Dennett among philosophers, with some additional mention of physicists-turned-philosophers, such as Penrose and Lockwood. The whole Australian school of central-state materialism (Place, Smart and Armstrong) goes unmentioned. I would have thought that Armstrong, for one, with his theory of consciousness as a brain scanning device, might be keen on the theory that consciousness could be based on a thalamic "spotlight" of attention scanning the different cortical areas. There is also no mention of any philosophical opponents of reductionism such as Nagel or McGinn, nor any mention of materialists who take a *non-reductive* view based on supervenience, rather than the type-type identities of reductionism. I imagine that Crick would tear his hair out if he read McGinn's (1994) argument that, while he takes a materialist view of the mind-body problem, he thinks that our very cognitive structures will prevent us from ever explaining consciousness.

1.7 All in all, Crick's hypothesis will not be so very astonishing to many readers of this journal; but it, and Crick's use of it in surveying the relevant experimental literature, make for fascinating and entertaining reading.

References

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