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The Astonishing Hypothesis: The Scientific Search for the Soul. Francis Crick. New York: Charles Scribner's Sons, 1994, 317 pages, $25.00 hard.

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"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" (Crick, 1994, p. 3). It is my impression that Crick's astonishing hypothesis is a variation on Horace Barlow's (1972) neuron doctrine of perception (see Crick footnote, p. 7). However, if Crick's hypothesis is an attempt to recreate the power and generality of DNA codes in neuron form as Barlow hoped to do (see Barlow, 1972, p. 391, "Acknowledgements"), the reader would have been given a better sense of direction if that had been set out in a clear fashion.

Crick's astonishing hypothesis, as most readers of *JMB* will recognize, is not really that astonishing or anything new. The idea that the brain, along with the rest of the nervous system, is the fundamental player in experience is a very old one, and I think that it is more commonly accepted among scientists and lay people than Crick believes. One of my favorite landmarks in the history of this idea is one provided by Nobel laureate (1906) Santiago Ramon y Cajal, "As long as our brain is a mystery, the universe — the reflection of the structure of the brain — will be a mystery" (*ca.* 1898, see Churchland, 1986).

More recently Paul MacLean (1975, 1990), and I (Vandervert, 1988) have independently begun to articulate thoroughgoing brain-based epistemologies that include Crick's astonishing hypothesis. For example, within the framework of what he calls "epistemics" MacLean points out that,

> Every behavior selected for study, every observation, and every interpretation, requires subjective processing by an introspective observer. Logically, there is no way of circumventing this or the other inescapable conclusion that the cold, hard facts of science, like the firm pavement underfoot, are informational transformations by the viscoelastic brain. No measurements obtained by the hardware of the exact sciences are available for comprehension without undergoing subjective transformation by the "software" of the brain. (MacLean, 1990, p. 5; nearly the same wording appears in MacLean, 1975, pp. 214–215)

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My Neurological Positivism bases everything that can be known on transformations of the algorithmic organization of the brain (Vandervert, 1988). Before Crick's book, then, the astonishing hypothesis had already been given statement in a variety of forms.

This point is indicative of the book's major flaw. Namely, that there appears to have been lack of forethought and a somewhat cavalier disregard for the importance of previous work in the development of topics substantive to the hypothesis. Here are a couple of examples. In the first chapter, Crick tackles the problem of why his hypothesis seems so surprizing. He proposes that the hypothesis is astonishing, in part, because many people are reluctant to accept the reductionistic approach. He thus charges off into a defense of reductionism. I don't think wariness of reductionism is a problem here. It seems that the astonishment Crick is attempting to get at is related to a deeper problem — the intuitive reasonableness of naive realism. I think most people, including most scientists, implicitly assume that the world they see "out there" is the truth, the whole truth, and nothing but the truth. This assumption spills-over into a belief that mathematics some how also represent an independent, but abstract, reality. So, when a more brain-based position on the nature of reality is proposed it *seems* highly counter-intuitive — in a word, it's astonishing! It is indeed difficult to recognize objectively that regardless of what is incoming from the environment, the world we see, smell, etc is erected completely inside our skulls.

Crick's treatment of the topic of consciousness (the actual agenda of the book — more on this in a moment) provides a second example of weak background development. In a foundational chapter on consciousness (chapter 2), three more or less non brain-based approaches to consciousness are described. An unsuspecting reader might well get the impression that existing neuroscience and neuropsychology approaches to consciousness either don't exist, or don't merit mention. This is far from the truth. Since the astonishing hypothesis bases everything including consciousness on the nervous system it seems reasonable that Crick's foundational chapter on the topic should have included mention of at least the following: Edelman (1990); Libet (1993); Milner and Rugg, 1992; and Pelletier (1990). Edelman and Libet are mentioned only much later in the text; their omission in the chapter on consciousness is puzzling. Also, anyone who is cutting consciousness teeth should consult the broader perspectives and research on animal consciousness provided by, for example, Donald Griffin (1984, 1992). It is of interest that Crick opens his book with a quote from *The International Dictionary of Psychology* that in part says, "Consciousness is fascinating but elusive phenomenon; it is impossible to specify what it is, what it does, or why it evolved. Nothing worth reading has been written on it" (p. ix). To the degree that this is true of consciousness, it remains so with the publication of *The Astonishing Hypothesis*.

Lack of thoughtful development also plagues Crick's treatment of religious issues related to the ideas of a soul, and free will. The complete title of the book, *The Astonishing Hypothesis: The Scientific Search for the Soul* is as misleading as it could possibly be. (I am not intimating purposeful foul play. A more appropriate title might have been selected.) There is absolutely no scientific search for the soul, but only a rather indifferent depreciation of the concept. Crick deals with the idea of a soul only from a simplistic definitional perspective. One would think that a neuron- or brain-based approach might inquire as to the *experience* of or *belief* in a soul. I wish Crick had posed the following question: Why and how might the brain give rise to something like the conceptions and experiences that are involved in

the belief in a soul? Extending some of MacLean's (1975) findings on functions of the brain's limbic system, I have proposed that the experience of a soul can be preserved in a brain-based model of reality (Vandervert, 1994).

Crick's treatment of the idea of free will is equally weak, although he does treat free will as an experience. In "A Postscript on Free Will," Crick suggests *where* free will might be located in the brain (anterior cingulate sulcus). However, the clinical report he cites to support his speculation is not about free will at all but only about willing in the motivational sense. Willing and *free* willing are worlds apart. The significant questions about free will do not concern where it might be in the brain (although it would be nice to know), but rather why creatures would have it, and how it works. Crick offers nothing on these latter two questions. It is possible that free will was selected for in creatures because it bestowed the advantage of surprise in prey/predator situations. Chaotic patterns of attack and escape would provide creatures with behavior that would be to the astonishment of both pursuer and the pursed. Even the pursuer, for example, would be surprised by the unfoldment of its own behavior. Certainly anyone who thinks deeply or plies his or her art intensely can testify that the unfoldment of one's own behavior and thoughts is often full of surprises.

Finally, Crick's book is not about the articulation of the astonishing hypothesis per se but about consciousness. Those who forego reading the preface might miss this point entirely. The real agenda of the book is to propose "the *experimental* study of consciousness in a serious and deliberate way" (xii). Crick (along with colleague Christof Koch) chooses visual awareness as a model for the scientific study of consciousness. His reasons for this choice seem sound. Most of the core of the book is devoted to research on visual awareness — good treatment but nothing new here. However, I am worried that this may be a case of the old story of the drunk looking for his lost key, not where he lost it, but under the streetlight where the light is better. I think the mechanisms of consciousness are elsewhere. It is my view that consciousness is both more pervasive and more fundamental in the brain than is visual awareness, and involves diffuse brain circuity that includes portions of the somatosensory system, the limbic system, and the aspects of cognitive functioning (Vandervert, 1993). After all, Helen Keller, for example, seemed reasonably conscious. All in all, once past the title, the book is anticlimactic to say the least.

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