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Book Review

Computational Mind: A Complex Dynamics Perspective by V. G. Ivancevic, and T. T. Ivancevic. Berlin: Springer, Studies in Computational Intelligence, Volume 60, 2007. 691 pages, over 700 references. ISBN 978-3-540-71465-1. Electronic edition ISSN 1860-9503.

This very large and solid book is written by two applied mathematicians who are based in South Australia, and is most unusual in its coverage, as it spans cognitive psychology, artificial and computational intelligence, and chaos theory, with quantum consciousness and computation. It is more of an encyclopedia than a readable review. Thus to evaluate it one needs some knowledge of a diversity of disciplines that are not often brought closely together under one cover. The authors claim the book is suitable for a one-semester course, I would have been amazed if anyone could digest it in less than three years, and that after at least a graduate-level education with a mainstream in mathematics.

The book is structured into three mega-chapters, the first on Human and Computational Mind, reviews cognitive psychology from Plato and Aristotle through Fechner and Wundt to Spearman and Burt and Hofstadter and Eccles, to name only some. Factor analysis gets a strictly mathematical treatment, Bayes is traced back to his original paper, Gauss and Lobachevsky are reviewed, Kohonen, Hopfield and fuzzy nets are there, and many of the names cited get a biographical footnote that extends up to two-thirds of a page.

The second chapter is devoted to Chaotic Brain/Mind Dynamics, and begins with a section on chaos in EEGs. It is virtually a short dictionary of technical terms in nonlinear dynamics that leads into oscillations, conservative versus dissipative dynamics, attractors, repellers, fractal dimensions, and saddle-node bifurcations. Chaos control gets a useful detailed treatment, with Lyapunov exponents, and the various sorts of dimensions discussed. This leads into entropy, and synchronization. An unusual sub-chapter on the complexity of humanoid robots, and the design of robots to match the human kinetics of locomotion is influenced by what is called the "human biodynamics engine," an area in which the authors have published three previous books, listed in the references section.

Chapter three is devoted to quantum computational mind. It begins with a review of Dirac-Feynman quantum dynamics, to set the ground for their exposition of a unified theory of matter and mind. This relies on the work of R. Mould, as (p. 584) "no one knows what there is about a conscious organism that gives rise to either consciousness or state reduction." They go on, "the model requires that a conscious organism spontaneously creates a profusion of

macroscopic quantum-mechanical superpositions consisting of different neurological configurations … The result is a superposition of different neurological states, each of which may be accompanied by a different subjective experience." Taking 584 pages with a profusion of heavy algebra to come up with this sort of smoke and mirrors explanation, makes one wonder if it is worth the effort. It leads (p. 592) to "motivational cognition in the life space foam," which seems to be a re-naming of Lewinian force-field theory. The authors are very firm-minded on what they think are measurable and useful properties of neurophysiological data, which is still a contentious area of research when body-mind relationships are involved.

A long summary of quantum physics and its 19th century history leads into the Penrose-Hameroff theory of quantum chaos within cell microtubules as the basis of consciousness. It is uncritically reviewed, and Churchland's criticisms are ignored. As Churchland (2002) put it, "there is no dearth of crackpot theories on every topic, from consciousness to sunspots," and "the explanatory vacuum is catastrophic" (pp. 194-197 on microtubules). The authors, I think, can be seen as having an inbuilt preference for anything created by physicists, and support the view that ultimately any explanation of consciousness must be grounded in quantum theory. Like string theory, it has a lot of literature and a paucity of unambiguous conclusions.

In trawling through the vast collection of references I did spot one citation of a paper in NDPLS, but mostly we are in different worlds.

REFERENCES

Churchland, P. S. (2002) *Brain-wise: Studies in neurophilosophy*. Cambridge, Mass: MIT Press.

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