

Book Reviews

Alwyn Scott (ed.)

Encyclopedia of Nonlinear Science

London: Routledge. 2004. 1052 pp.

ISBN 1-57958-385-7

Reviewed by Hugh Noble

Nonlinear systems (NLS) are so called because they cannot be modelled by a straight line graph or any multidimensional mathematical equivalent. It is an awkward fact that most natural systems are nonlinear. Even when a mathematical description of an NLS can be written, typically using differential and/or partial differential equations, the equations are often intractable. At one time simplifying assumptions were sometimes used to gain a foothold, but in the last thirty or forty years the almighty computer has made it possible to deal with many NLS without recourse to simplification.

For those of us not equipped to deal with the mathematical concepts involved, the whole field of nonlinearity tends to exist on the periphery of our knowledge. We have all heard of the ‘butterfly effect’ and the way it frustrates our ability to predict global weather patterns over a long period of time. We have all seen the beautiful graphic images of the Julia Set and have heard of the concept of ‘attractors’. But we tend to keep that awareness out of the reckoning when we think about natural systems.

This book is timely. It brings together, and makes available to a wider audience, a better appreciation of nonlinear phenomena and the extent to which nonlinear effects reach into almost every field of study. My own knowledge of mathematics is limited. What knowledge I do have is a relic from a previous incarnation, so it was with considerable trepidation that I agreed to review this book. I was encouraged, however, by the introduction to the volume where the editor identifies three objectives:

- (1) To provide an initial reference point for those wishing to begin the serious study one of the many topics covered;
- (2) To provide lecturers with a source for background material to augment their teachings;
- (3) To help readers, from other disciplines, to appreciate the many ways in which the concepts of nonlinear science have consequences for diverse topics.

Reasoning that I could legitimately put myself in that third readership category, I carried on. It was a rewarding experience. I know of no other book which approaches it for depth of treatment and for the diverse range of topics. A trawl of the Internet seemed to confirm that. The Internet itself offers the only challenge.

The book has 438 entries, written by over 300 contributors from about 30 different countries. The entries are arranged alphabetically. There is an alphabetic list and an alphabetic index. If a selected topic is not an entry heading, then it will probably be found in that index. At the conclusion of each entry there is a reference list and a 'see also' list. In addition, there is a thematic index in which the entries are grouped under 25 headings.

One does not normally read an encyclopaedia sequentially, but that is what I did. 'Read' is perhaps not quite the right verb. I went through the entries in alphabetic sequence. I read the opening paragraph of each and sometimes a bit more. At some point, I made a decision as to whether I would be able to read (and comprehend) the rest of that entry. About 10 percent of the entries were (for me) impenetrable. Another 40 percent were significantly mathematical, but I could nevertheless get a foothold on the material by reading the text between the maths (I also made a few quick forages into older and more familiar texts, to remind myself of the significance of various notations and mathematical concepts). About 15 percent of the entries in my sample had little mathematical content but did make frequent reference to mathematical concepts which I occasionally found difficult. A further 10 percent had no maths at all. The remaining 25 percent were references to entries elsewhere.

From this exercise I learned the following:

- The book will serve its primary and secondary aims admirably.
- The range of topics is enormous. It would be a strange reader who did not find something of interest.
- Amongst the austere mathematics, there are some delightful gems. I noted these: fairy mushroom rings; Faraday's lecture on candles; John Scott Russell, in 1834, on horseback, chasing a soliton wave along the Union Canal; dripping taps; the Royal Society, in 1845, dismissing as nonsense Waterston's ideas on the kinetic theory of gases (which were in fact spot on). I learned, in addition, how to make a variety of toys which walk, rock, bounce, scare deer and peck trees.
- The extent to which the entries accommodate the needs of non-mathematicians varies considerably.
- It is almost impossible to read the book sequentially. Again and again I was enticed into explorative diversions.
- To make such an exploration, is to experience the 'butterfly effect' at first hand. Two readers, starting at the same point, with the same intentions, will trace widely different trajectories. I stumbled upon 'Glacial Flow' which took me straight back to a former existence when I trudged snow, measured the mass balance of an Antarctic glacier and made observations which matched exactly some of the comments I now read in these pages.

Serendipity. That's the joy of a book like this, and it is an effect which the Internet cannot easily replicate.

But the typical reader of *JCS* (or what I imagine to be the typical reader) will be interested mainly in what the book has to say on the Butterfly Effect, on Quantum Mechanics, on Chaos and on the consequences which these things have for the concept of Determinism. Also relevant are essays on Artificial Intelligence, Cell Assemblies, Cellular Nonlinear Networks, Gestalt Phenomena, Neural Network Models, Neurones and others.

The editor and the editorial board are to be congratulated on the diligence with which they have brought together and presented this clever and interesting selection of topics. It is a handsome volume and would be a welcome addition to any academic library.

Paul Marshall

Mystical Encounters with the Natural World

Oxford University Press, 2005. pp. ix + 324. hbk.

ISBN 0-19-927943-8.

Reviewed by Chris Nunn

Foolishness to the average neuroscientist and a stumbling block to many philosophers, mysticism nevertheless refuses to go away. To those who have had it, mystical experience is often the most memorable event of their lives; those who have not are generally unable to see what the fuss is about — 'it's all moonshine, like an attack of romantic love', they say. There are other problems too, which the dust-jacket picture on this book aptly reflects. At first glance, I took this for a representation of Sophia benignly casting light over the world. Then it switched configurations like the face/vase illusion, and became a sinister Harpy looming over a mountain top. And it is true that mystical experience, a source of enlightenment to some, has also spawned mayhem and madness in desert fathers and sundry millenarians.

Paul Marshall writes from a basis in personal experience, but nevertheless with dispassion and impressive scholarship. In the book, he mainly discusses 'extrovertive' experience, which is of mystical union with, or illumination of, the natural world. 'Introvertive' experience, on the other hand, tends towards a contentless experience of union with some Absolute. Marshall touches on the latter mainly to point out that any dividing line between the two is hazy, particularly as the Absolute is sometimes pictured as a transcendent God not necessarily wholly distinct from one immanent in nature.

His particular interest is in the phenomenology of extrovertive experience, to which 'Part 1' of the book is devoted. He points out that this is far richer and more varied than one would imagine from the writings of many commentators. Moreover there is no hard and fast line to be drawn between drug-induced (or aided) experiences and meditation-induced or spontaneous ones. Near death experiences, too, often incorporate some of the same phenomena. This is the

most interesting and informative part of the book. Its only deficiency is lack of any detailed discussion of extrovertive experience in childhood, which, according to some accounts, is then more frequent and prevalent than later in life.

'Part 2' describes the 'Explanations' provided by a wide range of authors. Again Marshall's scholarship and indefatigability in pursuing the twists and turns of his subjects' thinking are impressive. It has to be said, though, that the explanations themselves are mostly a sorry lot. Some were based on extrapolation from vague ideas that happened to be 'in the air' at the time they were proposed — this was particularly true of those given by late nineteenth-century authors. Others simply shoehorned mystical experience into some pet theoretical framework, often ignoring or misrepresenting its actual phenomenology in the process. Freudian accounts are the most egregious examples of the latter type of explanation, but some religious thinkers have been almost equally guilty. A third group of would-be explainers incorrectly took their own extrovertive experience to be typical of all, and were thus led astray.

In fact none of the available explanations does justice to the phenomenology, says Marshall. His suspicion is that a Leibnizian idealism, modulated by modern neuroscience, may offer the best way forward. The neuroscientific approach that he thinks could be most helpful would be one that regarded the brain as a filterer, rather than a creator, of consciousness. Maybe so. My suspicion is that we have yet to unearth concepts needed to make sense of phenomenal experience in general. As Marshall says: 'Physics was the route by which mind was excluded from conceptions of the world at large, and physics may be the route by which mind finds its way back in.' Whatever the validity of speculations like these, his account shows that detailed study of the phenomenology of mystical experience provides a useful spur, and perhaps an important guide, to developing better concepts. And his book is itself a reliable guide to the current state of this particular art.

BOOKS RECEIVED

Mention here neither implies nor precludes subsequent review.

- Adams, William A., *What Does It All Mean? A Humanistic Account of Human Experience* (Imprint Academic 2005)
- Blackmore, Susan, *Consciousness: A Very Short Introduction* (OUP 2005)
- Blackmore, Susan, *Conversations on Consciousness: Interviews with Twenty Minds* (OUP 2005)
- Clarke, Chris (ed), *Ways of Knowing: Science & Mysticism Today* (Imprint Academic 2005)
- Daniels, Michael, *Shadow, Self, Spirit: Essays in Transpersonal Psychology* (Imprint Academic 2005)
- Lancaster, Brian L., *The Essence of the Kabbalah* (Arcturus 2005)
- Martin, Graham Dunstan, *Does It Matter? The Unsustainable World of the Materialists* (Floris Books 2005)
- Mullin, Glen H., *The Second Dalai Lama: His Life and Teachings* (Snow Lion 1994/2005)
- Rao, Ramakrishna and Marwaha, Sonali Bhatt (ed), *Towards a Spiritual Psychology: Essays in Indian Psychology* (Samvad India Foundation 2005)
- Spooner, David, *The Insect-Populated Mind: How Insects Have Influenced The Evolution of Consciousness* (Hamilton Books 2005)