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Book Review

Changing Mind: Transitions in Natural and Artificial Environments; Studies of Nonlinear Phenomena in Life Science, Vol. 9. By Franco F Orsucci. Singapore: World Scientific; 2002. 209 pages, index. ISBN 981-238-027-2.

European structuralism and American pragmatism seem strange bedfellows, especially read in the context of process philosophy, another American creation. Nevertheless, this mix is exactly what is found in this and several other recent books that examine the processes by which the brain creates meaning. It was Charles Sanders Peirce more than anyone else who created both the practical philosophy of pragmatism and the study of signs and their meaning, termed *semiotics*. Pragmatism emphasizes outcomes. Concepts such and *morality* and *truth* are judged on the merit of their results. For morality, "know them by their deeds," and for truth accept those ideas that are fruitful and productive. It is not a large step from this view to the notions that the brain leans about the world through interactions with it. Interactions between the brain and the environment yield both perception and knowledge. As both Merleau-Ponty and Walter Freeman explain, the hand learns the shape of a cup by grasping it. In this book Franco Orsucci, follows Freeman in showing that the idea of knowledge based on active engagement with the environment is simpatico with the notion that neural events in the brain are best understood in terms of chaotic dynamics. According to this view perceptual processes, as modeled in the famed studies of olfactory bulb responses to odorant stimuli, arise in the patterning of mass neuronal activity on the edge of chaos, shaped by both environmental stimuli and the history of those stimuli in the organism's past experience; in other words the stimuli and the *meaning* given those stimuli by the organism's past interactions with them.

The topic of *meaning* brings us back again to Charles Peirce and semiotics. Peirce and his European counterpart, Ferdinand de Saussure, founded separate schools of semiotics, the latter building on an analysis of language while the former emphasized formal relationships in his unique three-factor logic. It was Saussure's semiotics that laid the foundations for European *structuralism*, which emphasizes the relationships between linguistic or cultural elements. Ironically, however,

Merleau-Ponty, a French psychologist turned philosopher and phenomenologist and who dwelled on the periphery of this movement, emphasized *action* as the root of perception, in the fashion of the hand grasping the cup.

Why do I begin a review of Orsucci's book, *Changing Mind: Transitions in Natural and Artificial Environments*, with a lecture on the intellectual history of semiotics and structuralism? Because outside this frame of reference an English speaking reader may find the book puzzling on first nod. For instance, where is the *mind* in it? There is little about mind as a cognitive process in this book, while there is much about meaning and semiotics, and in particular how the brain, visualized as complex neural networks poised at the edge of chaos, creates meaning through interactions with the environment. In other words, it is a hybrid process-structuralist view of mind, which seems natural for Orsucci, at Rome's *Institute for Complexity Studies*. It may be well to recall that Italy is also the home of Umberto Eco, one of the leading and certainly best known contemporary semioticists. The book seems to have little in it that I could find about "transitions in natural and artificial environments."

If you have read Merleau-Ponty, or more importantly Walter Freeman, on these matters then the ideas in this book may not strike you as especially new. Its principal merit, for this reader, is the fascinating walk it offers through a menagerie of topics connected in one way or another to semiotics, consciousness, and the brain. It is rich with penetrating reflections on a range of topics that loosely orbit around the subjects of semiotics, neurology, and chaos theory, all of which are dear to the hearts of the readers of these pages. Beyond this, however, it was difficult for this reader to find the thread that ties all these topics together. I would say that the best approach to the book is as a good read and a review of topics ranging from Peircian semiotics, Freudian dynamics of the unconscious, dynamical models of courtship and love (reminiscent of Fred Abraham's classic "Jack And Jill" model, though without mentioning the latter), through European phenomenologists such as Husserl and Merleau-Ponty.

Aside from the above, there are a number of troubling production flaws in the book. One guesses that it is a translation of an Italian text, or perhaps Orsucci has written it in English without the aid of a native speaking editor. The text is not difficult to understand, but it is beset with small grammatical errors, mostly inconsistencies between singular and plural objects. Tables and figures are sometimes difficult to understand, with insufficient supporting text. And the entire book has the

appearance of just-adequate production standards. Perhaps, however, we should be glad to get this fascinating book at all.

I recommend the book as an interesting read and review for those interested in consciousness and the brain, but not as a useful introduction to these topics, because it assumes a sophisticated reader throughout.

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The Complex Matters of the Mind; Studies of Nonlinear Phenomena in Life Science, Vol. Edited by Franco F Orsucci. World Scientific; 1998. 210 pages, no index.; 77 USD. ISBN 981-023-339-6.

This is a collection of papers, mostly related to mind science, developed subsequent to the *International Conference on "Chaos, Fractals, and Models"* held at the University of Pavia (Italy) in November, 1996. The ten papers published here cover a range of interdisciplinary topics within the broad context of the sciences of complexity. The volume also includes a short but excellent foreword by Walter Freeman, briefly recounting the long history of paradigms by which the relationships between mind, body, and brain have been conceptualized, beginning with Hypocrites and humors, and ending with the current dynamical neural network understanding of the brain. Published in 1998 and now nearly ten years since the actual conference, it is still a worthwhile collection. The papers are not out of date, and as a group they present an excellent representation of the multi-disciplinarily that is the hallmark of the sciences of complexity when applied to the life sciences. Below is a brief outline of the chapters.

Arecchi begins the collection with a discussion of the linguistic metaphors commonly used to discuss complexity and complex systems. He examines a variety of conceptual models, each with its own set of rules for the use of its symbols, and its own semiotic assignments of meaning. He shows how the sequences of metaphors, which according to philosophers such as Lakoff are the very medium of thinking, are transformed by nonlinear dynamics from classical logic into fuzzy logic and then into dynamical semantic spaces.

Pietronero's essay surveys a wide range of physical systems that naturally evolve toward scale-invariant self-organizing configurations. These include biological and geological systems, disordered materials and the clustering of matter in the universe. The overall message is that such self-organization into complex scale-invariant process patterns seems a fundamental property of a wide range of physical systems. This

is an important conclusion, and consistent with the considerable present interest in scale-invariant networks.

Sulis examines the limitations of natural and formal languages for the analysis of behavior, reflecting on the value nonlinear dynamics as a new language. He also considers which dynamical properties can be effectively used to model intrinsic linguistic structures. He proposes an approach to these issues through the construction of dynamical automata that might provide behavioral evidence leading to an elementary understanding of the neural mechanisms by which thinking is carried out.

Orsucci develops creative models for psychosexual behavior and "the biology of relations." His approach combines insights from psychiatry with those of dynamical thinking about the human brain, incorporating not only cerebral activity but emotions and the autonomic and neuroendocrine systems as well. It is a fascinating article that serves as a useful reminder that human behavior occurs within the full context of embodied reality.

In a similar vein, Rinaldi and Gragnani consider the historical love affair between Petrarch and Laura, as the target for creative nonlinear modeling of dyadic love-hate relationships, leading to surprising new points of view and to provocative simplifications. The initial equations factor in pleasure and appeal, yielding a positive linear system in which appeal plays the central role. The authors then extend the model to include different types of personalities. They conclude that Petrarch apparently avoided the chaos of the classical three-body type by not mentioning Laura’s husband.

Meyer et al. report on the investigation of the electrocardiographic measurement of intervals between heartbeats using a number of powerful analytic tools, including dimensional analysis and multidimensional scaling as well as the exploration of fractals, periodic and aperiodic oscillations, and concepts of stationarity and autonomy. This work, including a comparison of the rhythm of a denervated heart after transplantation, is classic in considering the importance of chaotic dynamics in healthy as opposed to unhealthy biological systems.

While attacking psychoanalysis as an exact science, Stein argues that there is, in fact, an intelligent structure to irrational actions. He characterizes the latter as “play," which can be captured in descriptions based on nonlinear dynamics.

Continuing on a psychiatric theme, Schmid examines the utility of traditional and nontraditional models in the understanding of psychosis. He compares classical causally linear object-oriented psychiatry with nonlinear process-oriented psychiatry in terms of the characterization of dynamical disease as an abnormal form of chaos. He argues that the latter approach leads to new opportunities for diagnosis and control in the treatment. Interestingly, he suggests that though the developmental course of psychosis may be chaotic, its mental state may be a linearized information processing pathology.

Smith applies chaos theory to understanding the self-organizing properties of social communities, offering examples of grassroots organizations in small Italian towns. This approach is especially compatible with Walter Freeman's view that the human brain has evolved primarily as a social organ.

Finally, Giuliani concludes by making explicit the cautions as well as the potential of models from the physical sciences when taken as tools for re-formulating the domains of "soft sciences like economy, psychology and biology." Guiliana provides a valuable service in recognizing that models are metaphors to be used at different levels in a hierarchical view of the mind and body, but not to be taken too literally.

This book is recommended for libraries as well as for private collections for sophisticated readers in the multifaceted arena of mind, brain, and complexity.

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