

Dynamic Patterns: The Self-Organization of Brain and Behavior (Complex Adaptive Systems)

J. A. Scott Kelso

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foreword by Hermann Haken For the past twenty years Scott Kelso's research has focused on extending the physical concepts of self- organization and the mathematical tools of nonlinear dynamics to understand how human beings (and human brains) perceive, intend, learn, control, and coordinate complex behaviors. In this book Kelso proposes a new, general framework within which to connect brain, mind, and behavior. Kelso's prescription for mental life breaks dramatically with the classical computational approach that is still the operative framework for many newer psychological and neurophysiological studies. His core thesis is that the creation and evolution of patterned behavior at all levels -- from neurons to mind -- is governed by the generic processes of self-organization. Both human brain and behavior are shown to exhibit features of pattern-forming dynamical systems, including multistability, abrupt phase transitions, crises, and intermittency. Dynamic Patterns brings together different aspects of this approach to the study of human behavior, using simple experimental examples and illustrations to convey essential concepts, strategies, and methods, with a minimum of mathematics. Kelso begins with a general account of dynamic pattern formation. He then takes up behavior, focusing initially on identifying pattern-forming instabilities in human sensorimotor coordination. Moving back and forth between theory and experiment, he establishes the notion that the same pattern-forming mechanisms apply regardless of the component parts involved (parts of the body, parts of the nervous system, parts of society) and the medium through which the parts are coupled. Finally, employing the latest techniques to observe spatiotemporal patterns of brain activity, Kelso shows that the human brain is fundamentally a pattern forming dynamical system, poised on the brink of instability. Self-organization thus underlies the cooperative action of neurons that produces human behavior in all its forms.



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