the components and processes affecting the natural subsystem of the Everglades, with consideration also of the upstream Everglades Agricultural Area and the downstream Florida Bay. The disparate findings explicate the condition of the ecosystem, building a basis upon which it might be managed intelligently.

This volume is largely restricted to the natural part of the landscape, so much information essential from a management perspective is missing. The urban subsystem is not treated at all. The agricultural subsystem is summarized in one chapter, soon to be elaborated in A. B. Bottcher and F. T. Izuno's *The Everglades Agricultural Area* (University of Florida Press, forthcoming). The water-connected extremities of the Kissimmee River, Lake Okeechobee, Atlantic coastal estuaries, and the fringing reef are not treated here. Key findings on the biogeochemistry of Everglades wetlands are just beginning to be reported at conferences and in journals. A policy-development workshop of economists, political scientists, and legal experts was held in June 1994. Until those deliberations become public, the best treatments of Everglades policy are L. J. Carter's *The Florida Experience* (Johns Hopkins University Press, 1974) and D. John's *Civic Environmentalism* (Congressional Quarterly Press, 1994).

The substance of *Everglades* is the physical environment, limnology, plant, animal, and landscape ecology, and the biology of aquatic, endangered, and introduced species responsive to ecosystem change. Most of the authors argue that large-scale ecosystem restoration requires restoring the driving forces of the ecosystem, especially quantity and quality of freshwater flow, hydroperiod, and fire, rather than particular elements of biodiversity. However, those championing individual endangered species and top consumers or hoping for eradication of aggressively colonizing plants disagree. This signals a split between systems and species ecologists. Two hydrologic models are presented, one simulating the detailed consequences of water-management practices and a simpler one facilitating evaluation of the natural system under alternative policies. Current management has reduced the size of the system by half, broken up the water pooling pattern, pushed water westward, dried the lower part of the system over much of the year, and reduced the abundance of wildlife. Preliminary restoration goals are to increase the amount of water moving through the system and re-establish spatial continuity and seasonality of depth patterns, without damaging the urban and agricultural sectors. Nutrient-removal marshes are recommended in order to return urban and agricultural runoff to oligotrophic quality. Lake Okeechobee water should be delivered to the southern Everglades by flow-ways through the agricultural area, as proposed by the U.S. Army Corps of Engineers in 1955. The costs, effects, and robustness of these and other specific options need to be assessed. A key principle, to which Everglades research and policy does not conform, is that wetland management should relate to the entire catchment, include the effects of remote human land use and activities on the wetland, and account for human communities using or depending on the wetland resources.

Everglades research has been embodied in legislative action with astonishing speed. In 1993, Florida became the first state to mandate ecosystem-based management of natural resources. Florida's 1994 Everglades Forever Act establishes the nucleus of an eastern buffer strip of marshland that could conserve and cleanse urban runoff, recharge well fields, provide a groundwater head preventing seepage loss of Everglades water, and supply flow to the southern Everglades. Bolder steps will be needed to achieve these objectives, but the first step is taken. The act also establishes huge nutrient-removal marshes. Farmers are encouraged, with tax incentives, to reduce phosphorus concentration of water received by the marshes. Achieving oligotrophic performance standards in Everglades waters is deferred for 12 years, to provide time for establishment and equilibration of new farming practices, artificial marshes, and hydrological patterns. This new policy is the sort of bridge to the future advocated by *Everglades*, providing steps toward restoration and opportunity to learn. Lost in the translation has been public trust, because the science on which the policy is based is only beginning to appear.

Stephen R. Humphrey
College of Natural Resources and Environment, University of Florida, Gainesville, FL 32611, USA

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Non-Linearity and Behavior

Dynamical Systems in Social Psychology. ROBIN R. VALLACHER and ANDRZEJ NOWAK, Eds. Academic Press, San Diego, CA, 1994. xx, 505 pp., illus. $55 or £42.

Ever since its beginning in Wilhelm Wundt's Leipzig laboratory, scientific psychology has struggled with a conflict between the richness and variety of its subject—the human mind and behavior—and the rigor and stern simplicity of "true" scientific research and modeling. Take for instance people's attitudes toward a political candidate or their feelings of love and aggression, topics typical of social psychological research. One's attitude may change in light of new information, but it may also remain the same or eventually change suddenly for no apparent reason. How can such unreliable behavior ever be caught in the form of a serious model, let alone a law of nature?

Roughly speaking, psychologists have taken either of two stances. According to one, psychological phenomena are qualitatively different from those that are studied by the physical sciences and thus require a different form of theoretical inquiry. The other claims that psychological models should be no different from scientific models in general and that the vagaries of the psychological realm are in a sense coincidental, the result of both the complexity of the network of variables that determines human thought and behavior and the problem of finding reliable measures for psychological phenomena.

The latter stance has won out, and this explains why so many psychological theories are in fact disappointing and apparently miss the point that common sense would consider the essence of the psychological, namely the complex, unpredictable, and fluctuating nature of human life.

Vallacher and Nowak's *Dynamical Systems in Social Psychology* presents an attempt at overcoming the ambivalent relationship between theory and phenomena that has haunted psychology for so long. The collection of essays addresses the problems of social psychology in particular, but much of what the authors are saying applies easily to other fields in psychology.

Traditionally, psychology has taken as its examplar an idealized version of scientific models that had their origin in attempts at describing the motions of celestial bodies. With such an examplar, psychology has indeed had a hard time building interesting models and theories. Recent advances in physics and mathematics, however, have opened an entirely new realm of concepts, theories, and phenomena, covered by at first exotic but now widespread notions like chaos, complexity, and nonlinearity. For instance, a simple equation that describes a wide range of natural phenomena—the logistic equation, which now often serves as the main didactic key to the kingdom of non-linearity—displays a number of properties that are similar to what we find in human behavior, such as sudden qualitative changes following no apparent shift in the magnitude of the causes.

Although non-linear dynamics has been around for quite some time, psychologists have only now begun to understand its usefulness and consequences. Probably for the first time in social psychology, Vallacher and Nowak have brought together a number of authors who try to establish a link between the concepts and tools of dynamic systems on the one hand and the

problems, data, and theories of social psychology on the other. A first group of chapters presents the reader with a general introduction to dynamic systems concepts. They do so in a non-technical but certainly not trivial way. Nowak and Lewenstein, for instance, describe notions such as deterministic chaos, attractors, and catastrophe models and apply them to examples from social behavior. Mandell and Selz introduce the reader to statistical dynamics and provide an overview of statistical properties of nonlinear dynamic systems. Those properties are very unlike the properties that can be found in the average social science statistics handbook. Unfortunately (but inevitably in light of the limited space available), this chapter is little more than an invitation to further reading.

A second group of authors employs dynamic systems concepts in a basically metaphorical way. They try to shed new light on old phenomena by recasting existing problem domains in terms like "cusp catastrophe" and "attractor spaces" (examples are chapters by Tesser and Achee on aggression, love, and conformity and by Eiser on attitude change). One could argue that a metaphorical approach is hardly more than a *testimonium paupertatis* from the side of poor old psychology, but such a claim clearly disavows the function of metaphor for a scientific discipline that has begun to explore a new theoretical universe. Metaphors play an important role in detaching the existing models from connotations they acquired in the fields where they originated (laminar flow in fluids, for instance) and in assimilating them to data and methods from an entirely different world of thought (such as social relations and behavior).

A third group of chapters presents actual dynamic systems modeling of data from social psychological experiments. Selz and Mandell, for instance, discuss the application of symbolic dynamics to individual differences in behavioral style. Vallacher and Nowak discuss an experiment on "on-line" tracking of changes in judgment and show that the dynamics of judgment is actually more interesting than the final judgments themselves.

In a summarizing chapter, Nowak, Lewenstein, and Vallacher argue for a social psychology that accounts for change instead of states and for the mutual (instead of asymmetric) causality that is typical of human social behavior. They argue that dynamic systems modeling does not merely imply the building of quantitative mathematical models but leaves ample room for qualitative approaches that will greatly enrich social psychology. The book, probably the first of its kind, provides a very interesting, accessible and informative introduction to a new and exciting approach to social psychology.

Paul van Geert
Department of Psychology,
University of Groningen,
9712 TS Groningen, The Netherlands

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