that matter Sinai, and the patterns of human-environment interactions are indeed different. In spite of the greater intensity of work conducted in Israel, and Cordova, of necessity, draws on materials such as pollen diagrams from the Kinneret, Israeli Dead Sea analyses, and Israeli isotope data from cave speleothems, the Jordanian materials presents a crucial counterbalance and complement to those from Israel. This is seen, for example, in the fundamental differences in the nature of desert pastoral adaptations in Jordan. The Jordanian desert is simply much larger than the Negev, and this has genuine effects on desert societies in such basic features as the nature of the seasonal round.

Finally, it should be noted that in adopting a truly longue durée approach, Cordova has attempted a perspective only rarely seen in Levantine archaeology, usually focused on historical events or at least specific periods. Few studies integrate both prehistoric and historic times, and even fewer encompass both deep prehistory as well as modern times. If one loses detail in such an approach, there is nevertheless a sweep of change conveyed over the long term which is well worthy of consideration. Cordova is to be lauded for this groundbreaking work.

Steven A. Rosen
Ben Gurion University of the Negev

COMPLEX ARTIFICIAL ENVIRONMENTS – SIMULATION, COGNITION AND VR IN THE STUDY AND PLANNING OF CITIES, Edited by Yuval Portugali. Berlin: Springer–Verlag, 2006.

Yuval Portugali is among the first geographers to give serious sustained thought to the relationship between geography and models of artificial environments. This book which he edited is a collection of essays that are the outcome of a three-day international workshop on the study of complex artificial environments that took place on the island of San Servolo, Venice, during April 1-3, 2004. Each contribution is a thoughtful and caring expression, due to Portugali's inspiration, of the researcher's interests on models of artificial environments. The notion of complex environments refers to theories of complexity and self-organization, as well as to artifacts in general, and to artificial environments, such as cities, in particular, which for many years has been the main academic and research interest of the editor.

The theories of complexity and self-organization originated in the "hard" sciences and by reference to natural phenomena in physics and biology. The study of artifacts, in contrast, as Portugali indicates, has traditionally been the business of the "soft" disciplines in the humanities and social sciences. The notion of complex artificial environments thus implies the supposition that the theories of complexity and self-organization, together with the mathematical formalism and methodolo-

gies developed for their study, apply beyond the domains of nature. Such a supposition raises a whole set of questions relating to the nature of 21st century cities and urbanism, to philosophical issues regarding the natural versus the artificial and to the implications that entail the use of sophisticated artifacts such as virtual (VR) cities and environments.

Cities have existed for more than 5,500 years, and something is very special about them, as Portugali indicates in his introduction. The first appearance of cities in Mesopotamia is one of the most important revolutions in the history of mankind because cities emerged with the invention of writing, which in turn marks the transition from prehistory to history and what is called the "rise of civilization". But while cities have existed for thousand of years, and a genuine society is only now emerging, we are on the verge of an urban revolution that is taking place in front of our eyes. For the first time in human history, the number of people living in cities is reaching 50% of the world's population, and cities such as Mexico City, Mumbai and Sao Paulo count today 16 to 18 million people each. They are world cities and form the centers of the globalization process. They indicate the more fundamental change of the urban evolution as the second revolution in mankind. The essence of that urbanism is replacing industrialization as the dominant force in society. In Portugali's view urbanism is replacing nationalism as the generative order of modern society. The second urban revolution doesn't mean the disappearance of nationalism, it means its urbanism. The dimensions of this process are the decline of the welfare nation-state and the process of privatization that accompanies this decline; the concurrent process of the emergence of a civil society that takes over many of the past duties and functions of the national welfare state; and the quantitative growth of cities and urbanism that entails a new realty in which crucial problems of many modern nations are no longer classical national problems but rather the problem of cities.

The notion of generative order in his view is taken from D. Bohm as an aspect of his theory of implicate order, while the view of nationalism as a generative order comes from his previous works on implicate relations. The theory put forward in implicate relations is that nationalism has become the generative order of modernism and modern society in two respects. First, in the sense that it is information content, that is the ideology of nationalism has become the only one accepted by all otherwise rival positions: socialists, Marxists, liberals, capitalists, democrats - all conform to the basic principles of nationalism. Second, throughout most of the 20th century, its material content emerged as the most dominant and legitimate political structure.

Regarding definition of cities he submits that the main reason for the failure to define cities is that the various attempts to do so were always made with reference to what in cognitive science is called classical categories. That is, groups composed of entities sharing necessary and sufficient conditions that define them as a category and distinguish them from other categories. And yet, cities are not classical catego-

ries. Cities are very large artifacts, in addition to being a member in the category of city. Each single city has a category-like structure in itself. Each can be described as a network of entities loosely connected by partial links and similarities. In each such city network, one can further identify elements and entities that are more typical of the entire city than other entities. The typical elements form the center of the image of that city, while other elements form its periphery. Each city evolves by means of self-organization, which is a central property of open and complex system. Self-organization explores the city as a complex self-organized and self-organizing system. It does so from the perspective of Physicist Hermann Haken's synergetic theory of complex systems and by means of their agents of cellular space, a family of agents base and cellular automata simulation models specifically designed for this purpose. At the core of synergetics is the view that the synergy between the many parts of a complex system which is driven by an internal or external control parameter, gives rise to several configurations of movement that enter into a competition. This competition is solved by means of the so-called slaving principle – when one or a few competing configurations win, in the sense of including the other parts of the system into a specific movement. This winning side can be likened to an attractor that governs the dynamics of a system.

Another theory which is much emphasized and developed in this book by the contributors is the synergetic inter-representation networks that attempts to capture the process of the production of artifacts, and this is due to two complementary purposes. One is in order to understand cognitive processes in general and their role in the dynamics of cities and similar artifacts, in particular. The second is to understand the production and evolution of artifacts, small and big ones alike, such as houses, cities, metropolitan complexes and other artificial environments.

Portugali's theory as presented in his guiding introduction also refers to forms of planning. He makes a distinction between top-down, global planning versus bottom-up local planning. The first refers to a planning process implemented by professionals, as city planners, architects and engineers, while the second is planning as a basic human capability. The first aspect relates to the general process of specialization and division of labor by which general human capabilities become professions. The second aspect relates to the nature of the city as an open, complex and self-organizing system. Due to the non-linearity inherent in the behavior of such systems, there is always a possibility that the local plans will be effective or even more effective than global plans in determining the city. The fact that global planning and local planning co-exist and interact in the dynamics of cities, and that in many cases local planning can be more dominant and effective in the overall process than global planning, implies that it must be perceived not as a reactive force, but an important source for planning ideas and initiatives.

Regarding models, Portugali submits that the city is a 3-dimensional spatial structure, and yet is similar to urban studies in general; the vast majority of urban simulation models are 2-dimensonal in their structure and logic. Certainly, there are

several good reasons for this tendency. The three dimensions of cities is negligible compared to their first two dimensions while humans have a strong tendency to perceive the city 2-dimensionality. However, the 2-dimensonality of urban theory and modeling has its drawbacks. Cities are 3-dimensional structures, and by ignoring this we ignore an important aspect of the urban dynamics. Plans which are 2-dimensional in their structure, like many if not most of urban plans tend to entail 2-dimensional solutions in flat cities. The recent wave of urbanism that is strongly related to globalization and to the rapid urban growth is also associated with a tendency to go up. The 3-dimensional urban simulation models are attempts to respond to this need.

Another subject concerns the new virtual (VT) technologies that enable us to produce urban objects, small objects such as buildings, roads and bridges, and large ones as neighborhoods and whole cities. This new media is elaborated through models. Every model can be a statement or a theory about the dynamics of cities, region or environments.

This book, which explores the possibilities of applying the theories of complexities and self-organization developed to account for various phenomena in the natural science to artifacts into the realm of humanities and social sciences, is divided into five parts. The first deals with general aspects of complex artificial environments; the second, with specific experiences of laboratories that in the last decade or so have specialized in that field; the third part focuses on cellular automata and agent base models, which are currently the main approaches to urban simulation models; the fourth deals with cognition related to real, electronic and virtual environments, that is, cognitive aspects related to the various urban simulation models; while the fifth part concentrates on planning. Twenty six contributors from the USA, Canada, The Netherlands, Italy, France, Sweden, Denmark, United Kingdom and Israel took part in this collection of essays.

It is an outstanding book. Even if one disagrees with the authors' philosophy, methodology and approach to complex artificial environments and urban planning, their analysis is compelling. It takes a supple mind to manage the intricacies of space, planning and modeling and a serious and thoughtful scholar to produce such an impressive book. The book makes a unique and vital contribution to the interdisciplinary field of geography and demonstrates the breadth of its scope

Elisha Efrat
Tel Aviv University