A growing urban problem

Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals

by Michael Batty

MIT Press: 2005. 648 pp. \$60, £38.95

Frank Schweitzer

Urban growth is one of the biggest challenges for humankind in the twenty-first century. The world's urban population is at present estimated to be growing by about 50 million people per year. This growth is still almost exponential, and saturation may be reached only by the middle of the century. So there is much discussion about estimates of land consumption, the manageable size of megacities, and simple ways to structure, if not to control, this vast spread of urbanization.

For this, a better understanding of the spatial dynamics of urban growth should be a precondition. In fact, urban planning, urban geography, urban economics and other related disciplines have put quite some effort into this problem. Although they provide insight into some details, they do not present the big picture of generic mechanisms underlying these complex dynamics. So it is reasonable to consider whether the theory of complex systems developed in different scientific areas over the past 30 years may provide a suitable toolbox for gaining such an insight.

In *Cities and Complexity*, Mike Batty, an expert in the area of urban modelling, unfolds the different aspects of urban change in relation to complex systems theory. The focus is on models and computer simulations: there is no introduction explaining what we already know about cities and growth, or any attempt at orientation on the phenomenological side. This is good and bad at the same time. Some readers will certainly miss a clear relation between cities as we know them and the rather abstract models and results for specific dynamic features, such as segregation or polynucleated growth. Others, however, will appreciate the insights into generic features of urban dynamics that can only be highlighted at the abstract level used. As the author puts it, the focus is "largely on experiments with models that provide us with analogies as to how cities develop and evolve".

These analogies are investigated on very different modelling levels relating to the different scales of urban dynamics. Models of fractal growth show analogies to the morphological structure of urban aggregates, and models of moving agents resemble the motion of pedestrians on streets and inside buildings. Many of these models use cellular automata, which allow a broad range of topics such as land-use patterns or regeneration of urban areas to be addressed. A 'desktop simulator' is described in more detail in one of the chapters, tempting

S. GALLUP/GETTY

The expanding sprawl of cities such as Athens highlights a need to understand urban growth.

the reader to play with the ideas discussed in the book. Unfortunately, the plan to put examples from the book together with related material on a website (www.complexcity.info) is yet to be realized.

The book certainly succeeds in making the topic of urban growth accessible and interesting to those already familiar with formal modelling of complex systems. However, practitioners in urban planning may find some of the concepts and models too abstract and 'academic' to give solutions. But at least they

should agree that this complex-systems perspective sheds new light on to the dynamics of urban evolution by highlighting relations to seemingly distant phenomena, such as swarming or epidemics. Apart from the necessary technical details of the models, the author gives a number of illustrative examples and facts to elucidate his viewpoint, widening the appeal of the book to a broader audience. ■

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A healthy interest

Doctor Franklin's Medicine

by Stanley Finger

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W. F. Bynum

If the creation of the American Republic can be taken as a high point of the Enlightenment, then Benjamin Franklin (1706–1790) is a central figure. Unlike many of the other Founding Fathers, he came from a humble background and had a gentle sense of humour. Self-taught, he made his initial reputation as a printer and publisher, especially of *Poor Richard's Almanac*, a phenomenally successful annual in a crowded market. In the almanac, Franklin's alter ego, Poor Richard, offered advice and homespun wisdom about health and much else besides. In his own persona, Franklin was

to do the same for the rest of his long life.

In *Doctor Franklin's Medicine*, Stanley Finger has assembled Franklin's many interactions with medicine, health and doctors. Given the attention that the iconic Franklin has already attracted from historians, there are few surprises here, but the impact of the whole package is formidable. Most doctors would have been well satisfied to have so changed the face of medicine; Franklin did it almost incidentally, in the midst of a busy life as a natural philosopher, diplomat and man of the world.

Franklin lived most of the second half of his life in England and France, on official business first on behalf of Pennsylvania, and then of the new nation. He was known abroad primarily as an electrician, a word that in those days carried rather different connotations. Through his famous experiment with a kite and lightning,