EMERGENT SPATIO-TEMPORAL DIMENSIONS OF THE CITY: HABITUS AND URBAN RHYTHMS, By Fabian Neuhaus. Cham, Switzerland: Springer: 2015.

Over the course of the last decade, we have witnessed unprecedented advances in the collection and utilization of high-resolution data on moving objects such as humans. This is a result of a variety of technological developments and the widespread availability of various sensors—but it can be attributed more specifically to tracking technologies such as GPS, mobile positioning, geocoded social media messages (such as Twitter tweets), and Bluetooth (Shoval et al., 2014). Most recently, researchers have also benefitted greatly from the development and widespread use of smartphones, which incorporate several tracking abilities in one device and can transmit the locations obtained easily and cheaply.

In parallel to this phenomenon, we are also witnessing a growing ability to analyze the huge space-time databases created by these tracking technologies. This is due to the continuous development of geographical information science/systems in particular and to the advances in our computing abilities more generally (Richardson et al., 2013). The collection and analysis of high-resolution space-time data that cover long periods of time open up enormous possibilities for initiating new lines of urban research and formulating new research questions that could not be answered previously. Batty (2013), in his seminal book, presents the foundations of the titular *New Science of Cities*, defining flows and their networks and introducing tools and theories that can be applied to understanding different dimensions of city structure.

The book *Emergent Spatio-Temporal Dimensions of the City* focuses on cycles and rhythms in the urban environment. These repetitive patterns—day and night, rush hour, weekends, train timetables, paydays, or yearly celebration days—are referred to as *habitus* throughout the book. The term is borrowed from anthropology in order to describe the cycles of activity and anchors them in a wider context. The book's central hypothesis is that these cycles as repetitive activities constitute a third dynamic element within the urban system of objects (the first element) and their interrelationships (the second element).

The book is divided into eight chapters, most of which are grouped in pairs to form four modules. Module 1 (chapters 2 and 3) represents the book's review of literature; the second module covers the empirical data collection and the applied methodologies; in the third module the results of the analysis are presented; and the findings are discussed in the final module.

The fieldwork undertaken in the Urban Diary project (presented in chapter 4) included 20 individual participants each in London and Basel. All were tracked for two months with GPS and mental and cognitive maps; interviews were used as well. Chapter 5 presents a different data set: social networking data mined from the Twitter microblogging platform for 20 major cities around the world. The chapter discusses both the advantages and the challenges of using social media for urban analysis.

Chapter 6 focuses on temporal aspects, bringing together the two data sets and evaluating them with regard to both clock time and experienced time. The individual and the collective—as well as cultural aspects of time and time conception—are discussed. Chapter 7 presents the same results from the spatial perspective, again including both data sets. The chapter focuses on investigating the spatial dimensions of repetitive movement patterns in the urban context. Whilst the time analysis in chapter 6 demonstrates the similarities in activity patterns, this chapter highlights the differences in spatial patterns. The specific morphology of each location leads to different results in terms of density of activity.

Chapter 8, the book's concluding chapter, presents a theory of temporality which explains the rhythmic city by combining the dimensions of time and space and suggesting an explanation of their production using a third concept—the *habitus*. It then analyzes the implications as a prelude to suggesting directions for further research on time and space in large cities.

The book ends with a glossary that is very valuable for the reader. Dozens of color illustrations and graphs are included, and these are immensely helpful in conveying the book's message. However, the 10 double-page color figures at the beginning of the book and 11 double pages at its end lack a proper explanation or legend. It is only when the reader reaches chapter 7 that he or she recognizes them as enlarged versions of illustrations contained within it.

Emergent Spatio-Temporal Dimensions of the City is based on the work that Fabian Neuhaus undertook for his PhD at the Centre for Advanced Spatial Analysis (CASA) under the supervision of Prof. Mike Batty and Dr. Andrew Hudson-Smith; it was accepted as a thesis by University College London in 2013. The research it describes constitutes another contribution to a growing trend: the investigation of cities using novel methods to either answer old questions or formulate new ones.

It is rather surprising, however, that *The New Science of Cities*—written by Neuhas's own supervisor and so relevant for this discussion in *Emergent Spatio-Temporal Dimensions*—is not even referenced once throughout the book's 298 pages. Furthermore, another well-known book, also closely related to the issues discussed in this one, is completely ignored by the author (Schonfelder and Axhausen, 2010).

The main strength of *Emergent Spatio-Temporal Dimensions* is its effort to link classical writers such as Henri Lefebvre, Kevin Lynch, and Torsten Hägerstrand to data and insight derived from new methods of data collection and observation, such as GPS and digital social media. The book's second asset is its collection of two groundbreaking data sets. The first of these is the combination of mental maps and actual tracking of participants using designated GPS devices. However, research using this method had already been published a year before the book's publication (Greenberg-Raanan and Shoval, 2014); this is not mentioned in the book. The second data set is the Twitter activity used as a proxy for activity in cities during certain periods of time (Chapter 6). This use of new types of social media for urban research

is highly innovative but, again, other relevant works in the field (Oliver and Heuser, 2013) were ignored and should have been noted.

The literature review throughout the book represents a major weakness. For example, the review of new theoretical and methodological advances in "time geography" during the last two decades is insufficient. In fact, most of the discussion is based on the first wave of literature and relates to the 1970s and 1980s. This pattern further repeats itself when it comes to the growing literature on the application of tracking technologies for urban research, which is for the most part ignored.

Finally, the publisher has given this book quite an expensive price tag: the hardcover version costs $179, the eBook's price is $139, and each chapter is sold independently for $29.95. This pricing will, unfortunately, ensure that its exposure is not sufficiently wide—especially in regard to graduate students, who are constantly seeking fresh theories and methods. This is a pity, but, sadly, it is one of the realities of contemporary publishing practices nowadays.

Despite the deficiencies outlined above, this book represents a significant work. I agree with Coulin Fournier in the book's foreword: the book is of fundamental importance because it lays out a new way of perceiving and understanding cities and hence, potentially, suggests new avenues for the design of better cities in the future. I certainly found it to be an interesting book; it will serve as a good read for urban geographers and planners as well.

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