



REPORT

The Origins of Scaling in Cities

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The Equations Underlying Cities

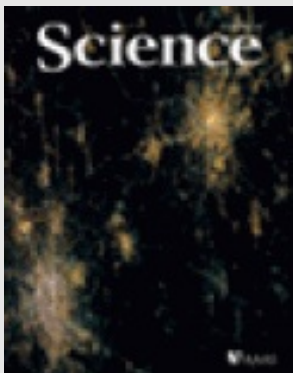
Cities are complex systems of which functioning depends upon many social, economic, and environmental factors. **Bettencourt** (p. **1438**; see the cover; see the Perspective by **Batty**) developed a theory to explain the quantitative relationships observed between various aspects of cities and population size or land area.

Abstract

Despite the increasing importance of cities in human societies, our ability to understand them scientifically and manage them in practice has remained

limited. The greatest difficulties to any scientific approach to cities have resulted from their many interdependent facets, as social, economic, infrastructural, and spatial complex systems that exist in similar but changing forms over a huge range of scales. Here, I show how all cities may evolve according to a small set of basic principles that operate locally. A theoretical framework was developed to predict the average social, spatial, and infrastructural properties of cities as a set of scaling relations that apply to all urban systems. Confirmation of these predictions was observed for thousands of cities worldwide, from many urban systems at different levels of development. Measures of urban efficiency, capturing the balance between socioeconomic outputs and infrastructural costs, were shown to be independent of city size and might be a useful means to evaluate urban planning strategies.

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