

2nd Annual Natural Philosophy Forum Distinguished Lecture
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Geoffrey West

Distinguished Professor and Former President,
Santa Fe Institute

The Simplicity, Unity and Complexity of Life from the Biosphere to the Anthroposphere

Although Life is probably the most complex and diverse phenomenon in the Universe, having evolved by the “random” forces of natural selection, many of its most fundamental characteristics scale with size in a remarkably simple universal fashion. From lifespans and growth rates to genomes, brains and tree heights and ranging from cells to whales, life manifests a systematic regularity following common universal laws dominated by the number four. Likewise, social organisations whether cities, companies or universities exhibit a similar systematic scaling: wages, profits, patents, crime, police, disease and infrastructure all scale in an approximately “universal” fashion across the globe. These laws, which transcend history, geography and culture, and which constrain much of the organisation and dynamics of life will be reviewed. A quantitative, predictive unified theory for their origin, and for understanding the coarse-grained dynamics, growth and organization of these systems, will be discussed. It is based on the underlying generic principles and mathematical properties of the networks that sustain life, ranging from vascular systems of organisms to the social and infrastructural networks of cities and social organizations. Their consequences have dramatic implications for growth, development, mortality and long-term global sustainability.

