Colloquium

Universal Scaling Laws in Biology From Genomes to Ecosystems

Towards a Quantitative Unifying Theory of Biological Structure and Organization

Prof. Geoffrey B. West

Santa Fe Institute, Santa Fe, USA

Despite its extraordinary diversity and complexity, many of life's most fundamental and complex phenomena scale with size in a surprisingly simple fashion. For example, basal metabolic rate scales approximately as the 3/4-power of mass over 27 orders of magnitude from molecular and intra-cellular levels up to the largest multicellular organisms.

It will be shown how these scaling relationships follow from underlying principles embedded in the dynamical and geometrical structure of space-filling, fractal-like, hierarchical branching networks, presumed optimised by natural selection. These ideas lead to a general quantitative, predictive theory that potentially captures the essential features of many diverse biological systems. oncept of a universal molecular clock.
Examples will include animal and plant vascular systems, growth, cancer, aging and mortality, sleep, cell size, genome lengths, DNA nucleotide substitution rates and the concept of a universal molecular clock.

When? Wednesday, 7 May 2008, 14.00 – 16.00

Where? ETH Zürich, HG G 60