

Physics of Complex Systems

Fall 2004

T: 4:30 p.m. – 5:45 p.m., BH 1610

T: 5:45 p.m. – 6:35 p.m., BH 1111

R: 5:15 p.m. – 6:30 p.m., BH 1510

Instructor: Sergey Buldyrev
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Extension: 430

Office Hours: TR: 3:00 p.m. – 4:00 p.m.

Required Texts: *Modeling Complex Systems* N. Boccara (NY, Springer, 2004).

Additional Reading: *An introduction to probability Theory and Its Applications*, W. Feller

(John Wiley & Sons, NY, 1968)

Introduction to Percolation Theory, 2nd ed., D. Stauffer and A. Aharony (Taylor and Francis, London, 1994)

Linked, A. L. Barabasi (Perseus Publishing, Cambridge MA, 2002).

How Nature Works, P. Bak (NY, Springer, 1996)

Scaling Concepts in Polymer Physics, P.G. De Gennes. (Ithaca, Cornell Univ. Press, 1979)

Giant Molecules: Here, There and Everywhere, A. R. Khokhlov and A. Y. Grosberg. (London, Academic Press, 1997)

Fractal Geometry of Nature, B. B. Mandelbrot (Berlin, Springer, 1996)

From Newton To Mandelbrot, D. Stauffer and H. E. Stanley (SF, Freeman, 1977)

An Introduction to Econophysics, R. Mantegna and H. E. Stanley (Cambridge, Cambridge University Press, 1999).

October 28	Diffusion Limited Aggregation, a model of bacteria colony	
November 2	Levy Distributions	
November 4	Levy Flights, a model of biological foraging	
November 9	Logistic equation: an example of chaotic behavior, model of population dynamics	
November 11	Long Range Correlations in DNA Sequences and Natural Time Series.	
November 16	Mutation-Duplication Model	
November 18	Random Multiplicative Process, Simple Repeat Expansion.	
November 23	Music and Heart-beat analysis.	
November 30	Properties of Stock Market fluctuations	
December 2	Dynamics of Industrial Firm Growth	
December 7	Preferential attachment model, Zipf Laws.	
December 9	Population of Cities, Word Frequencies	
December 14	Complex Networks	
December 16	Models of Social Interactions and Internet	
December 21	Review of Research Projects	
December 23	Review of Research Projects	
	Final	