

Special Colloquium Series, Spring & Fall 2005:

Between Nature and Science:

Advanced Modeling Concepts for Environmental Sciences



Constantino Tsallis
Santa Fe Institute and
Brazilian Academy of Sciences



Nonextensive Statistical Mechanics - Introduction and Applications

Thursday May 12th

4:00-5:00pm

PES 3001

Light refreshments provided

Boltzmann-Gibbs Statistical Mechanics is constructed upon hypothesis such as ergodicity. Many nonlinear dynamical systems -- typically those related to complexity -- do not satisfy this requirement. It is nevertheless possible to theoretically handle important classes of them through a generalization of the Boltzmann-Gibbs entropy. An introduction to this theory as well as to its dynamical foundations will be briefly provided. Some illustrative applications will be shown as well. Bibliography: (i) <http://tsallis.cat.cbpf.br/biblio.htm> ; (ii) M. Gell-Mann and C. Tsallis, eds., "Nonextensive Entropy - Interdisciplinary Applications" (Oxford University Press, New York, 2004); (iii) C. Tsallis, M. Gell-Mann and Y. Sato, cond-mat/0502274.

Constantino Tsallis, born in Athens, in 1943, and raised in South America, received a diploma in Physics at the Institute of Bariloche, Argentina and a "Docteur d'Etat ès Sciences Physiques" from the University of Paris-Orsay for research in the field of the Theory of Phase Transitions. In 1975 Dr. Tsallis accepted an appointment at the Universidade de Brasília, and two years later at the Centro Brasileiro de Pesquisas Físicas (CBPF) in Rio de Janeiro. The scientific themes in which he has researched include: (i) Critical phenomena and phase transitions in magnetism; (ii) Biogenesis, in a fecund collaboration with Ricardo Ferreira, that initiated him in themes closer to biology; (iii) Cellular automata, neural networks and chaos; (iv) Genetics and Immunology, in particular a model in space of configurations (referred to as "Tsallis model" in the literature); (v) Economics, where he collaborated in the formulation and study of certain microeconomic models that deserved some national and international attention; (vi) Fractals and applications in the evaluation, as a regular consultant of Petrobras, of Brazilian petrol reservoirs; (vii) Cognitive psychology, involving comparison of human memorization/learning processes with computer generated neural networks; (viii) Generalization of the Boltzmann-Gibbs Statistical Mechanics and Thermodynamics, formulated in 1988, that, to date, has motivated more than 1450 papers and theses performed by over 800 researchers of 51 countries (expressions such as "Tsallis entropy", "Tsallis statistics" and similar, are nowadays currently used in the literature). He published about 300 articles in journals and books of international distinction and delivered more than 700 lectures in events and institutions of nearly 40 countries. Dr. Tsallis has been the recipient of several awards including "Distinguished Scientist of the Greek Diaspora", the "Rio de Janeiro City Prize for Science and Technology", and the "Mexico Prize for Science and Technology".

Upcoming Speakers:

19-May **John Rundle** "Process, Pattern, Prediction: Understanding Complexity in Driven Dynamical Systems"
2-Jun **Jim Crutchfield** "Multiagent Dynamical Systems"

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