

Date: November 29, 2007

Speaker: Dr. Miron Kaufman, Cleveland State University

Title: Potts-Percolation Model of Solids and Entropy of Electromyography Time Series

Abstract: In the first part of the presentation, I describe research done in collaboration with H. T. Diep, Universite Cergy-Pontoise. We study a statistical mechanics model of a solid. Neighboring atoms are connected by Hookian springs. If the energy of a spring is larger than a threshold, the spring is more likely to fail, while if the energy is lower than the threshold the spring is more likely to be alive. The phase diagram and thermodynamic quantities, free energy, numbers of bonds and clusters, etc., are determined using renormalization-group and Monte-Carlo techniques. The second part of the seminar is based on a research collaboration at Cleveland State University, with U. Zurcher and P. S. Sung. A nonlinear analysis based on Renyi entropy is applied to electromyography time series from back muscles. The time dependence of the entropy of the electromyography signal exhibits a crossover from a diffusive regime at short times to a plateau at longer times. We argue that this behavior characterizes complex biological systems. The plateau value of the entropy can be used to differentiate between healthy and low-back-pain individuals.