

California State University, Fresno  
Spring 2008 Mathematics Lecture Series

presents

**ADAM LANDSBERG**

Claremont McKenna, Pitzer, and Scripps Colleges

**"NONLINEAR DYNAMICS and COMBINATORIAL GAMES:  
The renormalization of Chomp"**



Friday, April 18, 2008 from 4:00 to 5:00PM  
Education 172

Combinatorial games, which include Chess, Go, Checkers, Chomp, and Nim, have both captivated and challenged mathematicians, computer scientists, and players alike. Using the game of Chomp as a prototype, I will describe a methodology that reveals surprising connections between combinatorial games and some of the central ideas of nonlinear dynamics: scaling behaviors, complex dynamics and chaos, universality, and aggregation processes. Our central finding is that the game possesses an underlying geometric structure that "grows" (reminiscent of crystal growth), and we show how this growth can be analyzed using a renormalization procedure adapted from physics. Not only does this provide powerful insights into the game of Chomp (yielding a complete probabilistic description of optimal play and an answer to a longstanding question about the nature of the winning opening move in Chomp), but more generally it offers a mathematical framework for exploring this unexpected relationship between combinatorial games and modern dynamical systems theory.

*Dr. Landsberg earned his BA in Physics from Princeton University and his PhD in Physics from the University of California, Berkeley. He held a postdoctoral position at Georgia Tech and has been an Associate Professor of Physics at Claremont McKenna, Pitzer, and Scripps Colleges for the past 10 years. His research interests include: applications of dynamical systems theory to problems in fluid dynamics, general pattern formation, synchronization of oscillator arrays, queuing theory, economics, and combinatorial game theory.*

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