Archived Colloquia
2007/08

October 19, 2007: Doron Zeilberger (Rutgers University)

Title: ***Mathematics: An Experimental Science Indeed*** (Flyer)

Abstract: A year ago, in this very same colloquium, my good friend and collaborator Herb Wilf gave a talk with almost the same title (without the last word). However, he was talking about Experimental Mathematics the way it is done today and in the next few years. I will talk on how it would be done in fifty years.

November 2, 2007: Sam Payne (Stanford University)

Title: ***Bidding Games - Theory and Practice*** (Flyer)

Abstract: What happens if you play your favorite two-player game, such as connect four or chess, but instead of alternating moves you bid against your opponent for the right to move? The bidding works like this – suppose you and your opponent both start with one hundred chips. If you bid ten for the first move, and your opponent bids twelve, then your opponent gives you twelve chips and makes the first move. Now you have one hundred and twelve chips, your opponent has eighty-eight, and you bid for the second move. The goal is simply to win the game; chips have no value when the game is over. The basic theory of such games is simple and elegant, with a surprising relation to random-turn games, in which the right to move is determined by a coin flip. In practice, these bidding games are fun and disorienting. Even tic-tac-toe becomes a challenge.

February 29, 2008: Steve Bleiler (Portland State University)

Title: ***Schooling, Implicit Collusion, and the Fundamental Theorem of Poker, or What to do when the Guppies are eating the Sharks.*** (Flyer)

Abstract: Ever notice in some *good* poker games how the *weakest* players seem to always come out on top, while the *strong* players do poorly and mutter about how *lucky* their opponents are? This is no accident! There are powerful game-theoretic principles at work here, ones that, on the surface at least, appear to contradict Sklansky's famous Fundamental Theorem of Poker. We'll review these principles, exploring a bit of mathematical game theory (which is really not so much about games as it is about making correct decisions) along the way. Then we'll investigate their application, and finally develop the strategic adjustments a good player must make in order to prevail over one's opponents in this environment.

April 4, 2008: Daniel Goldston (San Jose State University)

Title: ***Primes and Twin Primes*** (Flyer)

Abstract: I will talk about recent joint work of mine with Janos Pintz and Cem Yildirim on small gaps between primes. A surprising consequence of our work is that if the primes

are well distributed in arithmetic progressions then one can prove results not too far from the twin prime conjecture. For example, if the Elliott-Halberstam conjecture is true then there are infinitely many pairs of primes with difference 16 or less. Unconditionally we can prove a long-standing conjecture in the field: there are pairs of primes much closer together than the average distance between consecutive primes. This work has had its share of media attention, and even generated a song on public television, and I will include some of the high and low aspects of such coverage.

April 11, 2008: Glenn Hurlbert (Arizona State University)

Title: ***Extremal Sets, Probability, and Graph Pebbling*** (Flyer)

Abstract: In this talk, we will explain how the following three questions are related. Which family of N k-sets has the smallest boundary? When is it likely that an n-vertex graph can't be properly 6-colored? How should one move pebbles through a network with tolls in order to reach a target? This is joint work with Bekmetjev, Brightwell, and Czygrinow.

April 18, 2008: Adam Landsberg (Claremont McKenna, Pitzer, and Scripps Colleges)

Title: ***Nonlinear Dynamics and Combinatorial Games: The Renormalization of Chomp*** (Flyer)

Abstract: 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.