Submittee: Karen Yeats
Date Submitted: 2012-08-20 09:56
Title: Miniconference on combinatorial models
Event Type: Conference-Workshop

Location:
SFU, room K9509

Dates:
August 13, 2012

Topic:
Combinatorial models and their applications in other sciences including physics, computer science, biology, and chemistry.

Methodology:
In the morning there were four 45 minute lectures. In the afternoon there was a session where we discussed exercises and open problems, and then there was a networking session for the students while the faculty discussed organizing and funding our future collaboration.

Objectives Achieved:
The objective of this miniconference was to better link together our research programs and our students. This was achieved as we found two new projects in the intersections of our programs, strenghened existing collaborations, and let our students meet each other and feel part of a larger group.

Scientific Highlights:
see "Objectives Achieved".

Organizers:
Yeats, Karen, Mathematics, SFU.// Mishna, Marni, Mathematics, SFU.// Rechnitzer, Andrew, Mathematics, UBC.// Soteros, Chris, Mathematics, USask.//

Speakers:
Speaker 1: Karen Yeats, Mathematics, SFU. Title: Combinatorics and QFT: Hopf algebras, recurrences, and denominators. Abstract: I will explain the role of combinatorics in the Hopf algebraic perspective on quantum field theory, and discuss some nice mathematical problems which arise. This includes recent work with Nicolas Marie on expanding Dyson-Schwinger equations using

chord diagrams, and with Iain Crump on characterizing when the 5 invariant of a graph splits.// Speaker 2: Marni Mishna, Mathematics, SFU. Title: Applied Analytic Combinatorics: Random generation and enumeration. Abstract: Many different problems can be effectively modelled using combinatorial classes. In this talk we will discuss 3 examples of discrete models, and the information that can be obtained by analytic combinatorics. Namely, we consider lattice diagrams; Arc diagram representations of secondary RNA; and genomic models.// Speaker 3: Andrew Rechnitzer, Mathematics, UBC. Title: Approximate enumeration. Abstract: Self-avoiding walks and polygons are simple combinatorial models of polymer. A key problem is to enumerate the number of such objects of size n - but this remains stubbornly unsolved. An alternate approach is to trade precision for speed and approximate these numbers. The Rosenbluth algorithm is a widely used method for such approximate counting. I will describe a generalisation of the Rosenbluth algorithm that allows us to enumerate objects that do not have (obvious) unique constructions, such as self-avoiding polygons. The key to this generalisation is a simple counting lemma that has potential applications to other problems such as the growth series of groups and stack sorting of permutations.// Speaker 4: Chris Soteros, Mathematics, USask. Title: Combinatorics and Polymer Modelling: Asymptotics, random generation and statistical analysis. Abstract: With the goal of understanding polymer entanglements, for over 20 years there has been interest in questions about knotting and linking of self-avoiding polygons on the simple cubic lattice. During this period there has been progress both theoretically and numerically and much of this progress has been motivated by questions arising from the study of DNA topology. For lattice models, these questions lie at the interface between statistical mechanics, enumerative combinatorics, topology, graph theory and applied probability/Monte Carlo methods. I will review the connection between combinatorics and statistical mechanics with respect to lattice polymer models and review some proven and some conjectured asymptotic properties. Finally I will present my group's recent progress using Markov Chain Monte Carlo data to estimate knot-transition probabilities after a local strand passage in a good solvent (Marla Cheston and Kevin McGregor) and under varying solvent conditions (Matthew Schmirler), as well as progress using transfer-matrix methods to study polygons confined to a tube and under the influence of an external tensile force (Jeremy Eng).

Links:

Comments / Miscellaneous:
Thank you, PIMS, for your support.
