Applied Combinatorics and the Natural Sciences I
(Chair/Président: **Chris Soteros** (University of Saskatchewan)
Org: **Marni Mishna** (Simon Fraser University), **Chris Soteros** (University of Saskatchewan) and/et **Karen Yeats** (Simon Fraser University))

IAIN CRUMP, Simon Fraser University
Forbidden minors and Feynman graphs

For a planar three-connected graph G that avoids three particular minors, we demostrate an ordering on the edges of this graph such that the graphs induced by edges of index less than or equal to j and edges of index greater than j share at most three vertices for all indices $1 \leq j \leq |E(G)|$. This class of graphs and edge ordering has applications in computing residues of Feynman integrals.

MARNI MISHNA, Marni Mishna
A combinatorial approach to lattice path asymptotics

Several different approaches to determine the exponential growth for lattice paths restricted to the quarter plane have recently appeared. This talk will survey this recent progress and offer a relatively simple strategy that is surprisingly general, gives tight bounds and sheds some insight on the fundamental differences between walks restricted to a region defined by one boundary, and those restricted by two boundaries. Work in collaboration with Samuel Johnson (SFU) and Karen Yeats (SFU).

ALEKS OWCZAREK, The University of Melbourne
Exact solution of two friendly walks above a sticky wall with single and double interactions

We find, and analyse, the exact solution of two friendly directed walks, modelling polymers, which interact with a wall via contact interactions. We specifically consider two walks that begin and end together so as to imitate a polygon. We examine a general model in which a separate interaction parameter is assigned to configurations where both polymers touch the wall simultaneously, and investigate the effect this parameter has on the integrability of the problem. We provide a full analysis of the phase diagram that admits three phases with one first-order and two second-order transition lines between these phases.

MICHAEL SZAFRON, University of Saskatchewan
Using self-avoiding polygons to study DNA-Enzyme Interactions

DNA experiments demonstrate that Type II topoisomerases unknot and unlink DNA in preparation for cellular processes such as replication, but how the enzyme identifies a "knotted region", from which it selects a site to act, remains an open problem. To study this problem, a measure for determining the "knotted region" is required. In this presentation, a new measure for identifying a knotted region in a "pinched" self-avoiding polygon (SAP) and knot-type dependent properties of this measure will be presented.

STUART WHITTINGTON, University of Toronto
Partially directed walks and polymer adsorption on striped surfaces

Polymers can adsorb on striped surfaces and then be pulled off the surface by the application of a tensile force. Because of the stripes there is a strong dependence on the direction in which the force is applied. The polymer can be modelled as a partially directed walk in three dimensions interacting with a (striped) impenetrable plane and the model can be solved completely at the level of generating functions. The long polymer behaviour can be extracted from the singularity structure of the generating functions.

This is joint work with Gary Iliev and Enzo Orlandini.