Combinatorics Seminar

Friday December 7, 2012 at 2PM

Room MS.03

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Combinatorial Species of Structure
and Cluster Expansions

In the 1980s Joyal proposed the idea of Species of Structure to unite many of the ideas in combinatorics at the time into an integrated whole. The notion of Species of Structure is a powerful technique, due to its generality and the extensions that have been added to it, such as virtual species, since the original conception.

In Statistical Mechanics, the problem in question is that of understanding the Virial Expansion, which has been recognised as a weighted sum over two-connected or irreducible graphs and the Cluster Expansion, which is a weighted sum over connected graphs. A recent development has been in the case of multispecies expansions of different types of particles, which translates as coloured species of structures, where we use multisets instead of the usual sets in the formulation of the Species of Structure.

I propose to explain the extension of the relevant theorems for single-type species of structure to this coloured case and how they provide an understanding of the coefficients of the multitype Virial Expansion. The main focus will be on the dissymmetry theorem for connected graphs, which is the key to obtaining the interpretation of the coefficients as weighted 2-connected graphs.

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