

Combinatorics in statistical mechanics

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Combinatorial species of structure has been a subject which has had a great impact on Statistical Mechanics, especially through the use of generating functions. It has been described as a Rosetta stone for the key models of Statistical Mechanics (Faris 08) through the way in which it has the capacity to abstract and generalise many of the key features in Statistical Mechanical Models. The talk will focus on developing the main notions of these species of structure and the algebraic identity called Lagrange-Good inversion, a method of finding the coefficients of an inverse power series. I will introduce some of the key concepts of Statistical Mechanics which indicate how they can be understood in the context of the combinatorial tools we have. These interpretations also indicate some interesting combinatorial identities. The final emphasis is on how the Lagrange-Good inversion can help us to obtain a virial expansion for a gas comprising of many types of particle, as was used in a recent paper (Jansen, T. Tsagkarogiannis, Ueltschi).