Title: Aspects of higher dimensional partitions

Abstract: MacMahon introduced higher dimensional generalization of the partitions of integers. The two-dimensional version are called plane partitions and the three-dimensional versions are called solid partitions. These combinatorial objects are easy to define but very hard to study. MacMahon conjectured a generating function for higher dimensional partitions and proved the one for plane partitions decades later. The other conjectures are wrong. I will discuss results associated with two aspects of higher dimensional partitions in dimensions > 2. First, I will discuss properties of higher dimensional partitions for a fixed positive integer but with dimension being varied. For fixed $n>0$, I show that it suffices to know the first [n/2] numbers to determine all higher dimensional partitions of n. Second, I will discuss the asymptotic behavior of higher dimensional partitions. Here, we keep the dimension fixed and ask how the number of higher dimensional partitions of n behave at large n. We discuss upper and lower bounds on these numbers and how they rule out certain conjectures.