NAVEENA RAGUNATHAN, McMaster University

The Lefschetz Properties of Artinian Rings Associated to the van der Waerden Simplicial Complex

The Lefschetz Properties are a well-studied characteristic of Artinian rings, with its history tracing back to Stanley's study of the Lefschetz Properties on complete intersections. In this talk, I will discuss the occurrence of the Lefschetz Properties on Artinian rings created from the Stanley-Reisner ring of the van der Waerden simplicial complex, further quotiented out by the squares of all variables. These simplicial complexes, defined on positive integers n>k, are generated by all arithmetic progressions of size k on n variables. We prove that for the smallest and largest possible values of k, namely k=1,2, and n-1, we always have the occurrence of the Weak Lefschetz Property. We also examine the first occurrence of failure at k=3, and prove that this failure propagates for all higher n values. I will also give a complete characterization of when our simplicial complex is a pseudo-manifold, and the implications this has on the occurrence of the Weak Lefschetz Property in certain degrees. Finally, I will present some recent ideas from joint work with Dr. Brett Nasserden, in which we generalize the failure of the k=3 case to all odd values of k, and examine the case of characteristic p.