ALGEBRAIC GEOMETRY AND COMMUTATIVE ALGEBRA SEMINAR

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Date: Friday, February 17, 2017
Time: 4:00 PM
Location: 258 Hurley Hall

Lecture Title:
Finite free resolutions and Kac-Moody Lie algebras

Abstract

Let us recall that a format $(r_n, \ldots, r_1)$ of a free complex $0 - - > F_n - - > F_{n-1} - - > \ldots F_0$ over a commutative Noetherian ring is the sequence of ranks r_i of the i-th differential d_i. We will assume that rank $F_i = r_i + r_{i+1}$. We say that an acyclic complex F_{gen} of a given format over a given ring R_{gen} is generic if for every complex G of this format over a Noetherian ring S there exists a homomorphism $f : R_{gen} - - > S$ such that $G = F_{gen} \otimes_{R_{gen}} S$. For complexes of length 2 the existence of the generic acyclic complex was established by Hochster and Huneke in the 1980's. It is a normalization of the ring giving a generic complex (two matrices with composition zero and rank conditions). I will discuss the ideas going into the proof of the following result: Associate to a triple of ranks (r_3, r_2, r_1) a triple $(p, q, r) = (r_3 + 1, r_2 - 1, r_1 + 1)$. Associate to (p, q, r) the graph $T_{p,q,r}$ (three arms of lengths $p - 1, q - 1, r - 1$ attached to the central vertex). Then there exists a Noetherian generic ring for this format if and only if $T_{p,q,r}$ is a Dynkin graph. In other cases one can construct in a uniform way a non-Noetherian generic ring, which deforms to a ring carrying an action of the Kac-Moody Lie algebra corresponding to the graph $T_{p,q,r}$.

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