ON THE ASYMPTOTIC BEHAVIOR OF REGULARITY

J. Herzog

In a pioneering paper, Bertram, Ein and Lazarsfeld [BEL] proved that if $X \subset \mathbb{P}^r$ is a smooth complex variety of codimension s which is cut out scheme-theoretically by hypersurfaces of degree $d_1 \geq \ldots \geq d_m$, then $H^i(\mathbb{P}^r, \mathcal{I}_X^n(a)) = 0$ for $i \geq 1$ and $a \leq d_1 n + d_2 + \cdots + d_s - r$. Their result has initiated the study on the Castelnuovo-Mumford regularity of the powers of a homogeneous ideal. In this talk I will give a survey of joint results in papers with Conca, Cutkosky, Hoa and Trung. For the ordinary power I^n of a graded ideal in a polynomial ring, the regularity is a linear function of n for large n. We also consider symbolic powers, saturated powers and initial ideals of powers. In these cases one can only expect linear bounds. This is proved in some cases.

DISCRETE POLYMATROIDS

J. Herzog

The discrete polymatroid is a multiset analogue of the matroid. Based on the polyhedral theory on integral polymatroids developed in late 1960's and in early 1970's, I present joint work with Takayuki Hibi on the combinatorics and algebra on discrete polymatroids. In particular I discuss a conjecture of N. White regarding the relations of matroids, and the corresponding conjecture for polymatroids.

KOSZUL ALGEBRAS AND MODULES

J. Herzog

I report on joint work of progress with Iyengar in which we study the linear part of a resolution. In a recent paper, Eisenbud, Floystad and Schreyer (Sheaf cohomology and resolutions over the exterior algebra , preprint 2001) have shown that the linear part of a resolution of a finitely generated graded module over the exterior algebra eventually predominates. This means that the linear part of a free resolution, which by its definition is just a complex, is exact in high homological degree. We show that a similar theorem holds for certain classes of standard graded algebras. Necessarily such an algebra must be Koszul, but no all Koszul algebras have linear dominance. It will also be discussed for which algebras there is a global bound for linear dominance.