



Second Laureate Fundamental Research



- ◆ **Project Title:** Homological and Combinatorial Methods in Commutative Algebra
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Abstract:

An important motivation for using homological methods goes back to 1956 when Auslander, Buchsbaum, and Serre proved this theorem: “a commutative Noetherian local ring R is regular if and only if the residue field k has finite projective dimension.” This introduced the idea that finiteness of a homological dimension for k singles out rings with special properties. An aspect of my research is homological method, with a primary focus on certain dualities that expand upon the work of Auslander et al.

In 1975, a new trend in commutative algebra arose with the work of Richard Stanley who used the theory of Cohen-Macaulay rings to affirmatively prove the upper bound conjecture for spheres. It then turned out that commutative algebra supplies basic methods in the algebraic study of combinatorics for convex polytopes and simplicial complexes. The other aspect of my research is the study of monomial ideals from both algebraic and combinatorial points of view.

The results of this research have been published in more than 60 papers in international journals and have been cited 125 times by 72 different authors.