1056-13-6 **Olga Holtz*** (holtz@math.ias.edu), Institute for Advanced Study, School of Mathematics, Einstein Drive, Princeton, NJ 08540, and **Amos Ron** (amos@cs.wisc.edu), Department of Computer Sciences, University of Wisconsin-Madison, 1210 West Dayton street, Madison, 53706.
Zonotopal algebra, analysis and combinatorics.

A great number of geometric and combinatorial properties of a given linear endomorphism X of R^N is captured in the study of its associated zonotope $Z(X)$, and, by duality, its associated hyperplane arrangement $H(X)$. Of particular interest in various applications is the case $n \ll N$. We perform this study at an algebraic level, and associate X with three algebraic structures, referred as *external, central, and internal.* Each algebraic structure is given in terms of a pair of homogeneous polynomial ideals in n variables that are dual to each other: one encodes properties of the arrangement $H(X)$, while the other encodes by duality properties of the zonotope $Z(X)$. The algebraic structures are defined purely in terms of the combinatorial structure of X, but are subsequently proved to be equally obtainable by applying suitable algebraic or analytic operations to either of $Z(X)$ or $H(X)$. The theory is universal in the sense that it requires no assumptions on the map X, and provides new tools that can be used in enumerative combinatorics, graph theory, representation theory, polytope geometry, and analysis. (Received September 22, 2009)