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Hal Schenck (schenck@illinois.edu) and **Alexandra Seceleanu*** (asecele2@illinois.edu).
Weak Lefschetz Property and Powers of Linear Forms.

Classically, the weak Lefschetz theorems compare the topology of complex projective varieties and of their hyperplane sections. In an algebraic setting, an Artinian graded algebra has the Weak Lefschetz Property (WLP) if multiplication by a general linear form, from any graded component to the next, has maximal rank.

Let K be a field of characteristic zero. We show that an Artinian quotient of an ideal $I \subset K[x, y, z]$ generated by powers of linear forms has the Weak Lefschetz Property. Our approach is based on work of Brenner and Kaid who interpret the WLP in terms of the cohomology of the syzygy bundle associated to I . Our proof works without the semistability hypothesis of Brenner and Kaid, which typically does not hold.

Our result is significant as one of the few results on the WLP outside the class of monomial ideals or (almost)complete intersections. (Received September 04, 2009)