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**Juan C. Migliore\*** ([migliore.1@nd.edu](mailto:migliore.1@nd.edu)), Department of Mathematics, University of Notre Dame, Notre Dame, IN 46556. *The Geometry of the Weak Lefschetz Property.*

In a recent paper, F. Zanello showed that level Artinian algebras in 3 variables can fail to have the Weak Lefschetz Property (WLP), and can even fail to have unimodal Hilbert function. We show that the same is true for the Artinian reduction of reduced, level sets of points in projective 3-space. Our main goal is to begin an understanding of how the geometry of a set of points can prevent its Artinian reduction from having WLP, which in itself is a very algebraic notion. More precisely, we produce level sets of points whose Artinian reductions have socle types 3 and 4 and arbitrary socle degree  $\geq 12$  (in the worst case), but fail to have WLP. We also produce a level set of points whose Artinian reduction fails to have unimodal Hilbert function; our example is based on Zanello's example. Finally, we show that a level set of points can have Artinian reduction that has WLP but fails to have the Strong Lefschetz Property. While our constructions are all based on basic double G-linkage, the implementations use very different methods. (Received August 19, 2005)