

- Juan Migliore

Title: Expecting the unexpected

Abstract: The important paper of Di Gennaro, Ilardi and Vallès (J. London Math. Soc. 2014) gave (among other things) the first example of a set of points with a surprising geometric property, relating it to the failure of the Strong Lefschetz property for a certain ideal (namely they showed that $\times L^2$ does not have maximal rank). This led Cook, Harbourne, Migliore and Nagel (compositio 2018) to define unexpected curves in the plane, beginning a study of curves that arise from a finite set of points in the plane in the same way and making the connection to the Lefschetz properties more clear in general. Many papers arose since then, extending the notion of unexpected curves in the plane to unexpected hypersurfaces in projective space, and studying (among other things) the connections to Lefschetz properties (including the Weak Lefschetz property in some cases). Because these hypersurfaces are unexpected in a numerical sense, it is interesting to study situations where we expect this unexpected behavior. Some of these were observed in Harbourne, Migliore, Nagel and Teitler (Michigan Math J. 2019), and many are unexpected cones. In the Levico workshop on Lefschetz properties there was a work group studying unexpected hypersurfaces arising from this latter paper, and some of this work will appear as an appendix of a forthcoming paper of Chiantini and Migliore connecting unexpected cones to a very surprising and apparently rare geometric property concerning sets of points whose general projection to the plane is a complete intersection. Very recently, Favacchio, Guardo, Harbourne and Migliore have continued this, studying situations where we expect the numerical unexpectedness and can measure it. In particular, some results have been obtained in which the Hilbert function of a finite set of points forces the points to admit an unexpected hypersurface (this work is in progress). This talk will focus on the latter two forthcoming (as of March, 2019) papers.