Non-Commutative Resolutions of Singularities

Karen E. Smith, University of Michigan

Thursday, March 7, 2019 - 4:00pm to 5:00pm
CMU 226

A foundational result of Hilbert underlies all of algebraic geometry: an algebraic variety can be understood more or less completely by fully understanding its ring of regular (polynomial) functions. As we saw in the first two lectures, questions about varieties can be translated into corresponding questions about their coordinate rings—which are always commutative Noetherian rings—and then attacked with tools of commutative algebra. On the other hand, many of these algebraic tools make sense even for non-commutative rings. In the final talk, we consider what it might mean to have a “non-commutative” variety, and what it might mean that it is "smooth." We will introduce Van den Bergh’s idea of a non-commutative resolution of singularities, and again, show how working over a field of prime characteristic can provide insight into this problem.

Karen Smith is the M. S. Keeler Professor of Mathematics at the University of Michigan. In 2001 she was awarded the Ruth Lyttle Satter Prize “for her outstanding work in commutative algebra, which has established her as a world leader in the study of tight closure, an important tool in the subject introduced by Hochster and Huneke. It is also awarded for her more recent work which builds new bridges between commutative algebra and algebraic geometry via the concept of tight closure.”

Smith is the recipient of a Sloan Research Award, a Fulbright award, and research grants from the National Science Foundation and the Clay Foundation. She has twice (in 2002–2003 and 2012–2013) helped organize a Special Year in Commutative Algebra at the Mathematical Sciences Research Institute (MSRI) in Berkeley CA, and in 2014, she was an invited speaker at the International Congress held in Seoul, South Korea. Smith has been on the editorial board of eight journals, is the director of an NSF funded Research Training Group (RTG) program, which has supported ten PhD students, ten post-docs and five
undergraduates each year since 2005, and is co-author of An Invitation to Algebraic Geometry. She is featured in the book Complexities: Women in Mathematics edited by Bettye Anne Case and Anne M. Leggett.

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