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Extension Theorems in Complex Analysis and Geometry

Since the early 1960s with the work of J. J. Kohn and L. Hörmander, Hilbert space methods have played a central in role in several complex variables. In 1970 E. Bombieri introduced such methods to establish important results in number theory. Shortly after that, H. Skoda used L^2 methods to establish, among many things, central results in commutative algebra. Y.-T. Siu established many deep results in complex geometry, and in the late 1980s T. Ohsawa and K. Takegoshi made a breakthrough in L^2 methods in proving their celebrated extension theorem.

Two major developments came in the 1990s. Around 1992, K. Seip initiated a movement, later joined by R. Wallsten, B. Berndtsson, and J. Ortega Cerdà, to extend Beurling's results about interpolation and sampling sequences from Hardy spaces to so-called Generalized Bergman spaces. Some of these results were extended to higher dimensions by Forgacs, Ortega Cerdà, Schuster and myself. On the other side of the spectrum, Y.-T. Siu and J.-P. Demailly blew open many very sturdily fortified paths and the area of analytic methods in algebraic geometry has since then grown at an amazing rate. The crowning jewel was Siu's work on the Fujita conjecture and his proof of the deformation invariance of plurigenera, and it looks as though the Fujita and Plurigenera methods will be strong enough to complete many deep and interesting programs in algebraic geometry.

In this talk we will try to give an idea of the nature of the methods behind these results. We will start with the basic Hörmander solution of the dbar equation with L^2 estimates, and some of its applications. We will then review the new twist (literally) introduced by Ohsawa and Takegoshi, and how it relates to interpolation and sampling problems, as well as some extension problems in algebraic geometry.