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Singular integral operators with holomorphic kernels: counterexamples to the Lebesgue Space -theory

In this talk I will discuss joint work with E. M. Stein (Princeton U.) concerning the Lebesgue space theory for a family of singular integral operators in complex Euclidean space, whose integration kernels are holomorphic functions of the output variable. The main focus will be on counter-examples that show the optimality of the assumptions we make on the ambient domain (various kinds of convexity; boundary regularity). Specifically, I will first recall recently obtained counter-examples for the Cauchy-Leray integral for a family of pseudo-balls. I will then summarize work in progress that concerns the analysis of Lebesgue space-regularity for the Szego projection for the Diederich-Fornaess worm domain.