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Singular Integrals, Geometry of Sets, and Boundary Problems

Presently, it is well understood what geometric features are necessary and sufficient to guarantee the boundedness of convolution-type singular integral operators (SIO's) on Lebesgue spaces. This being said, dealing with other function spaces where membership entails more than a mere size condition (like Sobolev spaces, Hardy spaces, or the John-Nirenberg space BMO) requires new techniques. In this talk I will explore recent progress in this regard, and follow up the implications of such advances into the realm of boundary value problems.