This talk concerns recent and ongoing joint work with E. M. Stein on the optimality of the (analytic and geometric) assumptions that grant $L^p$-regularity for families of singular integral operators in higher dimension that are modeled after the one-dimensional Cauchy integral and the Szego projection. As is well known, dimension-induced obstructions (e.g., lack of conformal mapping) have major repercussions on the classical, one-dimensional theory.