

TEMPLE UNIVERSITY

Department of Mathematics

Analysis Seminar

Room 617 Wachman Hall

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Szegő Projections and Kerzman-Stein Formulas

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Hardy spaces constitute a classical topic at the interface between Complex Analysis and Harmonic Analysis and progress in a deeper understanding of their geometric and functional analytic properties can have a fundamental impact on related issues. For example, the direct topological sum decomposition of $L^2(\Sigma)$ into $\mathcal{H}_\pm^2(\Sigma)$ (traces on Σ of holomorphic functions on either side of Σ) in the case when Σ is a Lipschitz curve in the plane is equivalent to the boundedness of the principal value version of the Cauchy Singular Integral Operator on $L^2(\Sigma)$ (a famous result due to A. P. Calderón for small Lipschitz constants, and to R. Coifman, A. McIntosh and Y. Meyer in full generality). In this lecture I will address a closely related issue, namely the question whether the orthogonal projection P of the Hilbert space $L^2(\Sigma)$ onto the closed subspace $\mathcal{H}_+^2(\Sigma)$ (or $\mathcal{H}_-^2(\Sigma)$) has a bounded extension as an operator on $L^p(\Sigma)$ with $p \neq 2$. This is a rather delicate issue, which interfaces tightly with the geometric character of Σ . The main tools are a new generation of commutator estimates and a far-reaching extension of the so-called Kerzman-Stein formula from Complex Analysis. This is joint work with Marius Mitrea (University of Missouri) and Michael Taylor (University of North Carolina at Chapel Hill)