

**TEMPLE UNIVERSITY**  
Department of Mathematics

**Analysis Seminar**

Room 617 Wachman Hall

Monday, January 26, 2014, 2:40 p.m.

*Szegő Projections and Kerzman-Stein Formulas II*

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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  $\Sigma$  of holomorphic functions on either side of  $\Sigma$ ) in the case when  $\Sigma$  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  $\Sigma$ . 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)