Operator Theory and Analytic Function Spaces

The essential spectrum of the Neumann–Poincaré operator on a domain with corners

Karl-Mikael Perfekt
Norwegian University of Science and Technology (NTNU), Norway

The study of the Neumann–Poincaré (NP) operator (or the boundary double layer potential) of a domain dates back to Poincaré and Carleman's doctoral dissertation. At the time, the NP operator served as a prominent example in the abstract spectral theories proposed by Hilbert, Fredholm, and F. Riesz. Later, the NP operator was central in (quasi)-conformal mapping and in the development of the theory of singular integral operators. Very recently, the theory of new materials has revived the interest in the spectral properties of the NP operator, acting on the energy space of the domain. We use a classical similarity equivalence between the NP operator and the Ahlfors-Beurling transform of the domain to characterize the spectrum on a wedge in two variables. A localization argument combined with distortion estimates from conformal mapping leads to a complete description of the essential spectrum of the Neumann-Poincaré operator on planar domains with corners. Joint work with **Mihai Putinar**.