Workshop dedicated to the memory of Professor Gabriela Kohr
(6th edition)
Geometric Function Theory in Several Complex Variables and Complex Banach Spaces
Cluj-Napoca, Romania November 27 – 29, 2026

Applications of operator algebras and operator theory to boundary value problems and layer potentials

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Abstract

One of the main and oldest approaches to boundary value problems is through layer potentials. The study of layer potentials has lead, more than one hundred years ago, to the development of operator theory (including compact and Fredholm operators). The layer potential operators associated to a suitable boundary value problem on a smooth, bounded domain are pseudodifferential operators and, in order to establish the solvability of the given boundary value problem, the basic theory of compact and Fredholm operators suffices. By contrast, on a non-smooth polyhedral domains, the relevant operator algebras have a more complicated structure and the basic theory of compact and Fredholm operators does not suffice anymore. In my talk, I will present some ideas from operator algebras that are useful in order to treat boundary value problems on domains with cylindrical ends (equivalently, on domains with conical points). This is an introductory talk that I will try to make accessible to non-specialists, in general, and to graduate students, in particular.

The main results of my talk are from joint works with Marius Mitrea and Mirela Kohr.