

Banach Algebras 2009
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Group actions, von Neumann algebras and fundamental groups

ABSTRACT. Using the group measure space construction of Murray and von Neumann (1943), countable groups and their actions on measure spaces give rise to weakly closed *-algebras of Hilbert space operators, called *von Neumann algebras*. Probability measure preserving actions that are ergodic and essentially free lead through this construction to II_1 factors. The aim of the talk is twofold.

- Discuss the highly subtle relation between a group action and its von Neumann algebra: Connes' 1976 theorem says that all amenable group actions essentially lead to one single von Neumann algebra, while *Popa's rigidity results* provide group actions whose von Neumann algebra entirely remembers the group and the action.
- Give an overview of my joint work with Popa on the *fundamental group* of a II_1 factor. This invariant, introduced by Murray and von Neumann, is a subgroup of the positive real line \mathbb{R}_+ . Surprisingly, there are II_1 factors (with separable predual) whose fundamental group is uncountable, but yet different from \mathbb{R}_+ .