



Centre Interfacultaire Bernoulli (CIB)

3rd Bernoulli Lecture

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Room CM5 - 17h15 to 18h15

Recent applications of expanders in number theory: romance and screwball comedy

Emmanuel Kowalski - ETHZ



Emmanuel Kowalski is born in 1969 in Grenoble. Former student of Ecole Normale Supérieure de Lyon, he obtained his PhD from Rutgers University in 1998 under the guidance of H. Iwaniec. He was Veblen Research Instructor at Princeton University and at the Institute for Advanced Study and in 2002 became full Professor at Université de Bordeaux. Since 2008, he is Professeur ordinaire at ETH Zuerich. Besides his scientific achievements, Emmanuel Kowalski is also well known for his expository talent; he is most notably the author of the book "Analytic Number Theory" (jointly with H. Iwaniec) which is considered as the ultimate reference in Analytic Number theory.

Abstract

Expander graphs were first investigated about 40 years ago with motivation coming largely from theoretical computer science. It was realized first by Margulis, and then extended by many people, that deep mathematical results, coming in particular from number theory and representation theory, could be used to construct explicit examples of these graphs.

In the last three or four years, striking new applications of expander graphs in number theory have been discovered. In one, initiated by Bourgain, Gamburd and Sarnak, classical sieve methods turn out to fit so well with expanders that one feels that they were made for each other. In another (joint work with J. Ellenberg and C. Hall), on the other hand, a sequence of surprising lucky breaks is needed to arrive at the desired conclusion.

The talk will try to explain the context of expander graphs, and then discuss both of these developments, as well as some of the intriguing questions which arise.