

The structure of approximate groups and its geometric consequences

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I will present a recent joint work with Ben Green and Terence Tao, in which we establish a structure theorem for approximate groups. Approximate groups are finite subsets A of an ambient group which are almost closed under multiplication (the product set AA can be covered by a bounded number of translates of A) and we show that any such object is almost nilpotent in a certain sense. The proof makes use of ideas of Hrushovski pertaining to model theory as well as a reworking of the proof of the Gleason-Yamabe-Montgomery-Zippin solution to Hilbert's fifth problem about the structure of locally compact groups. In a second part of the talk, I will present various geometric applications of the result: to the growth of finitely generated groups (including generalizations of Gromov's theorem on polynomial growth) and to new results in Riemannian geometry in relations with almost flat manifolds and the Margulis Lemma.