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**Sebastian Donoso** and **Anh Le\***, Northwestern University, 2033 Sheridan Road, Evanston, IL, and **Joel Moreira**, **Martina Neuman** and **Wenbo Sun**. *Good lower bounds for multiple recurrence.*

In 2005, Bergelson, Host and Kra showed that if  $(X, \mu, T)$  is an ergodic probability preserving system and  $A \subset X$ , then for every  $\epsilon > 0$  there exist “many”  $n \in \mathbb{N}$  such that  $\mu(A \cap T^{-n}A \cap \dots \cap T^{-kn}A) > \mu^{k+1}(A) - \epsilon$  for  $k \leq 3$ , extending Khintchine’s theorem which deals with  $k = 1$ . They also showed that this estimate is false in general for  $k \geq 4$ .

This phenomenon is called multiple recurrence with good lower bounds. Good lower bounds for certain polynomial expressions was studied by Frantzikinakis in 2008, but several tantalizing questions remained open. In this talk we briefly survey this topic and answer some natural questions regarding polynomial expressions, commuting transformations, and configurations involving the prime numbers. We also present evidence that some other questions are probably very hard. (Received September 24, 2017)