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W Timothy Gowers*, Centre for Mathematical Sciences, Wilberforce Road, Cambridge, CB3 0WB, United Kingdom. *Probabilistic combinatorics and the recent work of Peter Keevash.*

Recently Peter Keevash settled a famous problem that was well over a century old, concerning the existence of designs, which are systems of subsets of a finite set that cover the finite set in a particularly even way. More precisely, a design with parameters (n, r, s, λ) is a collection A of subsets of an n -element set, each of size r , such that every subset of size s is contained in exactly λ sets from A . There are some trivial divisibility conditions that the parameters must satisfy: Keevash showed that if these conditions are satisfied and if n is sufficiently large, then a design with parameters (n, r, s, λ) exists. This was a vastly more general result than anything that had been previously proved, or indeed anything that looked likely to be proved.

The proof is probabilistic. This talk will be about the probabilistic method in general, and about the sophisticated new ideas that Keevash introduced in order to apply it to a problem that does not at first glance look suitable for it. (Received September 21, 2015)