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*When the sieve works*

Let  $\mathcal{P}$  be a set of prime numbers. A basic question in sieve methods is to understand how many integers up to  $x$  are composed of prime factors solely from the set  $\mathcal{P}$ . A standard probabilistic heuristic predicts that this number is about  $x \prod_{\substack{p \in \mathcal{P} \\ p \leq x}} \left(1 - \frac{1}{p}\right)$ .

We show that this is true if the set  $\mathcal{P}$  contains enough prime factors between  $x^{1/u}$  and  $x$ , for some fixed  $u$ . This is joint work with Andrew Granville and Kaisa Matomaki.