Title: L^p regularity for linear elliptic operators on $\mathbb{R}^N$ with constant coefficients

Abstract: Contrary to popular belief, the last word on L^p regularity for linear elliptic problems on $\mathbb{R}^N$ with constant coefficients was not spoken in the 1960s. For example, if $\Delta u \in L^p$, there are a few known side conditions ensuring that all the second order derivatives of u are in L^p, but no known necessary and sufficient one, except for the trivial "all the second order derivatives of u are in L^p".

It turns out that this question, and the analogous one for all the homogeneous (i.e., without lower order terms) Petrowsky-elliptic systems with constant coefficients -including pseudodifferential and even infinite-dimensional ones in UMD spaces- has a complete answer in the form of a simple growth limitation of u at infinity. Of course, growth is not evaluated pointwise. Interestingly, the correct measure of growth is closely related to conditions that have been used for decades in a multitude of Liouville-type theorems.