## Unreasonable Effectiveness of Number Theory

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**Abstract:** The year 2010 marks the 50th anniversary of the publication of Eugene Wigner's famous essay on the unreasonable effectiveness of mathematics in the natural sciences. Number theory, traditionally viewed as far removed from the sphere of applications, now plays a central role in constructing pseudo-random objects, which are used for applications ranging from distributed protocols for leader selection to network routing to sorting.

The focus of this talk is on connections between combinatorics, group theory and number theory linked together by the theme of randomness. More precisely, in the past two decades, deep results in automorphic forms and number theory were used to construct (optimal) expanders, which have wide applications in computer science. These techniques were generalized to construct higher dimensional spectrally optimal analogues. Recent exciting developments in arithmetic combinatorics provide new tools to construct families of good expanders, and these expanders in turn are used to obtain deep number theoretic results. We shall survey these developments.

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