COLLOQUIUM

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Yuri Matiyasevich (PDMI RAS)
A New Life of the Old Sieve

Prime numbers are one of the most important objects of study in Number Theory. Greek mathematician Eratosthenes (276--194 B.C.) invented a method (known nowadays under his name) for revealing primes among all natural numbers.

A more modern and powerful tool for studying prime numbers is Riemann's zeta function. In recent years the speaker performed intensive computer calculations in the search for new properties of this function. Unexpectedly, the Sieve of Eratosthenes naturally appeared in one calculation with the non-trivial zeros of the zeta function. This form of the sieve demonstrates a rich fractal structure lacking in the original sieve. Later another calculation revealed a different kind of sieve which is dual to the classical Sieve of Eratosthenes. So far no theoretical explanation was found for the observed phenomena.

The calculations were not an easy computational task. They required calculations of several thousands of initial non-trivial zeros of the zeta function with several thousand decimal digits and solving systems consisting of several thousand linear equations.

Everyone is welcome!