Title: ”42”

Abstract: In 1992 Ghosh and I conjectured that

$$\int_0^T |\zeta(1/2 + it)|^6 \, dt \sim 42 \prod_p (1 - 1/p)^4(1 + 4/p + 1/p^2)T(\log T)^{9/9!}$$

The 42 in the conjecture was later identified by random matrix theorists as a factor that occurs in the sixth moment of the characteristic polynomials of unitary matrices; this realization began a lot of work connecting the value distribution of L-functions and characteristic polynomials.

No progress has been made towards the sixth moment of \(\zeta\) but in joint work with Iwaniec and Soundararajan we have proven an asymptotic formula for the sixth moment of \(|L(1/2 + it, \chi)|\) when averaged over a suitable set of \(\chi, q\) and \(t\). Our formula has the same 42 that appears in the sixth moment conjecture for \(\zeta\). Our technique is based on what we call the ”asymptotic large sieve.”