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Irregularities of Dirichlet L-functions and a gap parity bias of zeros.

The integral of Hardy’s Z-function from 0 to $T$ measures the occurrence of its sign changes. Hardy proved that this integral is $o(T)$ from which he deduced that the Riemann zeta-function has infinitely many zeros on the critical line. More recently, Ivic conjectured this integral is $O(T^{1/4})$ and $\Omega_\pm(T^{1/4})$ as $T \to \infty$. These estimates were proved, independently, by Korolev and Jutila. In this talk, we will show that the analogous conjecture is false for the Z-functions of certain “special” Dirichlet L-functions. In particular, we show that the integral of the Z-function of a Dirichlet L-function from 0 to $T$ is asymptotic to $c_\chi T^{3/4}$ and we classify precisely when the constant $c_\chi$ is nonzero. This constant equals zero for most primitive characters, however there is a thin (but infinite) set of exceptions. Somewhat surprisingly, numerical evidence seems to suggest that the unexpectedly large mean value is caused by a currently unexplained parity bias in the gaps between the zeros of these “special” Dirichlet L-functions. This is joint work with Jonathan Bober and Micah Milinovich. (Received August 07, 2020)