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How the Edwards-Anderson Model reaches its Mean-Field Limit; Simulations in d=3,...,7[1] STEFAN BOETTCHER, STEFAN FALKNER, Physics Department, Emory University — Extensive computations of ground state energies of the Edwards-Anderson spin glass on bond-diluted, hypercubic lattices are conducted in dimensions $d = 3, \ldots, 7$. Results are presented for bond-densities exactly at the percolation threshold, $p = p_c$, and deep within the glassy regime, $p > p_c$, where finding ground-states becomes a hard combinatorial problem. The "stiffness" exponent y that controls the formation of domain wall excitations at low temperatures is determined in all dimensions. Finite-size corrections of the form $1/N^{\omega}$ are shown to be consistent throughout with the prediction $\omega = 1 - y/d$. At $p = p_c$, an extrapolation for $d \to \infty$ appears to match our mean-field results for these corrections. In the glassy phase, ω does not approach the value of $2/3$ for large d predicted from simulations of the Sherrington-Kirkpatrick spin glass. However, the value of ω reached at the upper critical dimension *does* match certain mean-field spin glass models on sparse random networks of regular degree called Bethe lattices.

[1] S. Boettcher and S. Falkner, arXiv:1110.6242;
[2] S. Boettcher and E. Marchetti, PRB77, 100405 (2008);
[3] S. Boettcher, PRL95, 197205 (2005).

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Stefan Boettcher
Physics Department, Emory University

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