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Nonstandard Finite-Size Scaling at First-Order Phase Transitions[1] WOLFHARD JANKE, MARCO MUELLER, Institute for Theoretical Physics, University of Leipzig, Postfach 100920, 04009 Leipzig, Germany, DESMOND A. JOHNSTON, Department of Mathematics, School of Mathematical and Computer Sciences, Heriot-Watt University, Edinburgh EH14 4AS, Scotland — We show that the standard inverse system volume scaling for finite-size corrections at a first-order phase transition (i.e., $1/L^3$ for an $L \times L \times L$ lattice in $3D$) is transmuted to $1/L^2$ scaling if there is an exponential low-temperature phase degeneracy. The gonihedric Ising model which has a four-spin interaction, plaquette Hamiltonian provides an exemplar of just such a system. We use multicanonical Monte Carlo simulations of this model to generate high-precision data which provides strong confirmation of the nonstandard finite-size scaling law. The dual to the gonihedric model, which is an anisotropically coupled Ashkin-Teller model, has a similar degeneracy and also displays the nonstandard scaling behavior. Further potential applications of the transmuted finite-size scaling law will be briefly discussed.

M. Mueller, W. Janke, D.A. Johnston, Phys. Rev. Lett. **112** (2014) 200601; M. Mueller, D.A. Johnston, W. Janke, Nucl. Phys. B **888** (2014) 214.

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Wolfhard Janke
Institute for Theoretical Physics, University of Leipzig

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