Special Issue

Violations of Hyperscaling in Phase Transitions and Critical Phenomena—in Memory of Prof. Ralph Kenna

Message from the Guest Editors

Universality is an emergent phenomenon, at least partially explained by the renormalization group. Because of universality, simplified theoretical models can deliver critical behaviour of real complex systems by trimming back to essentials such as dimensionality, symmetry group, and range of interaction. Universality classes of theoretical models and real systems are characterised by critical exponents that are linked through scaling relations between them. The scaling relations that involve dimensionality are referred to as hyperscaling. Due to the success of mean-field theory in highly connected systems, irrespective of the dimensionality of the systems, dimension-dependent hyperscaling is often said to fail there. That tenet was challenged recently with the introduction of new insights to the renormalization group aimed to rescue hyperscaling in high dimensions.

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