
DAVID ROWE, Department of Physics. University of Toronto, Toronto, ON, M5S 1A7

Quasi-symmetry, critical phenomena, and embedded representations

The use of symmetry in the description of physical systems has turned up a novel type of representation in group theory that has deep implications for understanding critical phenomena. Loosely speaking, if one is given a unitary representation of a group on a Hilbert space, it can turn out that the projection of this representation onto a subspace may be another unitary representation that is neither a subrepresentation nor a subquotient of the original; such a representation is called an *embedded representation*. This concept provides a natural framework for understanding why transitions between phases of systems, associated with different symmetries, frequently exhibit critical phenomena. It is observed that a system in one phase, appears to hold onto the symmetry associated with that phase until a breaking point is reached at which a rapid transition occurs to a new phase associated with a different symmetry. In fact, it appears that such an apparent symmetry, which we call a quasi-symmetry, is appropriately associated with an embedded representation that can change continuously as a system approaches a critical point.