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Induced False Vacuum Decay by Topological Solitons

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We review our work concerning the decay of the false vacuum by quantum tunnelling transitions. When the false vacuum manifold is non-trivial, it can lock in topological defects. We have considered the possibility that these are magnetic monopoles, cosmic strings, domain walls and most recently, Skyrmions. In all of these cases, the topological defect must realize the true vacuum inside its core. The dynamics generically traps the true vacuum in the core of the defect in a meta-stable state which is unstable to quantum tunnelling transitions. The transition typically inflates the core region until the region of true vacuum is large enough to inflate without restriction. We show how to compute the corresponding instanton and the decay rate using the path integral. Our analysis can be applied to phase transitions in cosmology within the context of field and string theory but also to condensed matter systems.

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