Microscopic Theory of Quantum Phase Transitions in Finite Nuclei.

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Covariant Density functional theory is used as a basis for a microscopic description of spectroscopic properties of quantum phase transitions in nuclei. Since it is well known that the mean field approximation breaks down in transitional nuclei, where configuration mixing and fluctuations connected with broken symmetries play an important role, a theory is developed which uses the Relativistic Generator Coordinate Method to perform configuration mixing calculations of angular momentum and particle number projected wave functions. Three-dimensional applications of this method require an extreme numerical effort. Therefore, for the study of triaxial shapes a five dimensional Bohr Hamiltonian is derived by constrained self-consistent relativistic mean-field calculations and the resulting spectra are used to study the behavior of characteristic physical quantities as a function of the physical control parameter ? the number of nucleons in the region of the phase transition.