Abstract Submitted
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A Quantum Mechanical Approach to Nuclear Rotations[1] NOUREDINE ZETTILI, Alfaisal University — We deal with the study of collective motion within the context of a quantum mechanical method – the nuclear Born–Oppenheirmer (NBO) method. We focus in particular on a quantum mechanical approach to nuclear rotations. As an illustration, we utilize the NBO method to study non-spherical, permanently deformed nuclei; in particular, we study nuclei that are axially-symmetric and even, but with non-closed shells. We also focus on a quantum mechanical derivation of formal expressions for the energy and for the moment of inertia. Using trial functions in which the intrinsic structure is described by a mean-field approximation, we then show that the NBO formalism yields the Thouless-Valantin formula for the moment of inertia and that this moment of inertia increases with angular momentum, in agreement with experimental data. We show that the NBO formalism is well equipped to describe low-lying as well as high lying rotational states. Additionally, we establish a connection between the NBO method and the self-consistent Cranking (SCC) model.

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