Abstract Submitted
for the HAW09 Meeting of
The American Physical Society

**Nuclear Rotations and the Born–Oppenheimer Method**[1] NOUREDINE ZETTILI, Jacksonville State University — We want to discuss the study of nuclear rotations and collective motion within the context of the nuclear Born–Oppenheirmer (NBO) method–a truly quantum mechanical method. As an illustration, we apply the NBO method to study permanently deformed (non-spherical) nuclei; in particular, we study nuclei that are axially-symmetric and even, but with non-closed shells. In the presentation, we focus on the derivation of formal expressions for the energy and for the moment of inertia. Using trial functions in which the intrinsic structure is described in 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, which is known to be successful in reproducing vast amounts of experimental data ranging from low-lying rotational states to high angular momentum states.

[1]Supported by the Alabama Commission on Higher Education.

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Date submitted: 24 Jun 2009 Electronic form version 1.4