

COLLECTIVE STATES AND NUCLEAR SYMMETRIES

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This paper had not been received when the volume went to press, but it will, if at all possible, be included as a post-deadline paper at the end of these Proceedings. The following discussion took place after the presentation of this paper.

DISCUSSION

A. Gelberg: 1) The IBM has reached a state at which we can investigate the validity limits of the model. They probably correspond to strong deformation and high spins (equivalently, introduction of g, i, etc. bosons). 2) What is the relation between your coherent state and that used by Ginocchio and Kirson?

V. Paar: 1) As I have presented in my talk, the IBM is a particular type of quadrupole phonon model in which certain anharmonic terms (already of the third order) are neglected. The error made by this approximation approximately corresponds to the error made by truncation of the boson expansion. Therefore, one should look back at old papers on the limitations of quadrupole phonon approach (phenomenological, boson expansion, etc.). 2) It is exactly the same. Ginocchio and Kirson have not been aware of the work done previously by Perelomov (Commen.Math.Phys., Springer Verlag, 1972) and Jolos, Janssen, Dönan (Yad.Fys. - Sov.J.Nucl.Phys., 1975).

N. Zeldes: I have two questions: 1) How close to doubly-closed nuclei can you use these models? 2) You mentioned a "Low Seniority" approximation in the quadrupole phonon model. Is this Seniority related to the Seniority introduced by Racah in the shell model?

V. Paar: Up to about 6 nucleons or nucleon holes. - It is only similar, in the sense that the larger number of phonons corresponds to lower seniority.

K.K. Seth: What do you think is the prospect of applying the IBA type models to the light nuclei of the s-, d-shell (like Mg, Si, etc.) in which collective features are well developed? One could profit from the economy of description of these models and integrate the rotational + β + γ vibrational levels which are abundant in these nuclei. It is in these nuclei that one can also test these models against microscopic theories.

V. Paar: Quadrupole phonon models, and so the SU(6) quadrupole phonon model as its special case, are applicable in the cases when the collective quadrupole mode is well developed, as is the case in most medium and heavy nuclei. This aspect is not as well pronounced in light nuclei, but for certain cases and properties (especially farther away from stability line) is present. For example, onset of deformation in the s,d shell due to lowering of f-orbitals may be described by collective quadrupole model. Generally, in light nuclei one would couple pronounced single particle degrees of freedom to these collective modes.