

## Isomers and Aspects of Nuclear Structure

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Nuclear isomers have played an important historical role in nuclear structure ranging from the classification of single-particle orbitals crucial to the development of the shell model, to the discovery of deformed nuclei and understanding of their dynamical motion. For example, the identification about 50 years ago [1] of a high-spin isomer in  $^{180}\text{Hf}$  catalysed the simultaneous development of collective models, nuclear pairing, and definition of the quantum numbers, such as the projection  $K$ , which describe deformed nuclear states [2]. The presence of isomers provides both a means of identification and characterisation and a possible signature of nuclear structure effects such as  $K$ -selection, large orbital configuration changes, specific shell effects such as seniority cancellation, and in principal, large deformation changes.

Developing techniques for the population of deformed heavy nuclei near stability and on the neutron-rich side of the stability line include multi-nucleon transfer or deep-inelastic collisions (see for example ref [3,4]) and relativistic fragmentation (for example [5]) some of which can be complemented by incomplete-fusion reactions.

New results on the properties of isomers directly above the  $N=126, Z=82$  doubly-closed shell include important valence configurations in  $^{211}\text{Pb}$  and  $^{211}\text{Bi}$  [7,8]. However, I will concentrate in this presentation on the discovery of new isomers in the deformed Er-Tm-Yb-Lu-Hf-Ta region (see ref [9-11] for earlier results) in the context of the mapping of intrinsic orbitals, the configurational structure of multi-quasiparticle states, and the various factors which govern the purity or otherwise of the  $K$ -quantum number. The understanding of specific mixing and  $K$ -purity also bears on the possible photo-excitation and survival in stellar sites of isomers such as the  $9^-$  metastable state,  $^{180\text{m}}\text{Ta}$ .

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