Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Microscopic origin of reflection-asymmetric nuclear shapes[1] MENGZHI CHEN, TONG LI, Michigan State University, JACEK DOBACZEWSKI, University of York, WITOLD NAZAREWICZ, Michigan State University — The existence of nuclei with stable reflection-asymmetric ground-state (g.s.) shapes has been supported by rich experimental evidence. Theoretically, a recent survey systematically predicts the regions of pear-liked shapes in the regions where the doublets of opposite parity shells with $\Delta\ell = \Delta j = 3$ can be found. In our work, we investigate even-even Ba, Ra, U and Yb isotopes in the framework of the Skyrme-Hartree-Fock-Bogoliubov theory. We study neutron-proton, neutron-neutron, and proton-proton multipole interaction energies and analyze their role in the onset of reflection-asymmetric deformations. We demonstrate that reflection-asymmetric deformations are driven by the neutron-proton part of the nuclear interaction energy of odd multipolarity. We also show that the small reflection-asymmetric deformation energies result from strong cancellations between even- and odd- multipolarity components of the nuclear binding energy. Therefore, high-multipolarity components, especially $\lambda = 5$, are crucial for the appearance of stable reflection-asymmetric deformations.

[1]This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics under award numbers DE-SC0013365 and DE-SC0018083 (NUCLEI SciDAC-4 collaboration); by the STFC Grant Nos. ST/M006433/1 and ST/P003885/1; and by the Polish National Science Centre under Contract No. 2018/31/B/ST2/02220.

Mengzhi Chen
Michigan State University

Date submitted: 05 Jan 2021 Electronic form version 1.4